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VIEWS, NEWS AND INTERVIEWS.

"The next great field lying ready to be cultivated by electrical engineers," said a thoughtful man, "is that of equipping large mills and manufactories with electric power. It's bound to come. Just consider the possibilities in such a line of work."

Emperor William of Germany has conferred upon Professor von Helmholtz the honor of an appointment to the membership of the privy council, with the title of Excellency.

The latest electrical device is a machine with four horizontal swinging arms revolving in a vertical plane. The driving shaft, a special feature, is keyed firmly to a diagonal slot, gearing into four six-sided pulleys. On the rack of the shaft is drilled a countersunk lag-screw, and all rivet and bolt holes are upset and turned to scale. The armatures, mounted on water-borne journals at either end, revolve independently, and motion is communicated to the machine by means of a crank turned by an Irishman.—*Puck.*

It is reported that the electrical exhibition, to be opened at the Crystal Palace, London, January 1, 1892, will be thoroughly representative and will form a complete record of 10 years of electrical progress. Over 200 requests for space have thus far been received. The exhibits will include electric lighting plants for country and town houses, mines, steamships, railway trains, private carriages, the newest forms of motors, generators, accumulators and other machinery employed for producing and storing electricity. Not only will the most eminent British electrical and engineering firms, with scarcely an exception, be represented, but several of the more important exhibits at the Frankfort exhibition will be transferred to the Crystal Palace. The apparatus exhibit will include a complete set of Sir William Thomson's standard electric instruments, new electro-medical and electro-thermic apparatus; the latest improvements in telephony and telegraphy, and also the most recent electrical appliances for war purposes, blasting and signaling.

A number of American electrical engineers, who have returned from the Frankfort Electrical Exposition, state that Europeans are far behind Americans in everything that pertains to electric traction.

The Cincinnati, Lebanon and Northern Railroad is a narrow gauge steam railway running from Cincinnati to Lebanon, Ohio, a distance of 29 miles. The route includes a number of the outlying and well inhabited suburbs of Cincinnati. The road has derived its chief income from the local passenger traffic. Within a short time this narrow gauge road has been almost paralleled by a cable road and two electric roads. Its local traffic has been attracted by these modern competitors, and the management has discovered that "something must be done" to keep the road on a paying basis. "If I had the road," said a Cincinnati electrical engineer, "I'd make it an electric line all the way in from Lebanon. You could make as good or better time than is now made. You could run cars every 15 minutes, and you could do the freight business without any trouble." Mr. Henry Lewis, who is largely interested in the Northern road, is convinced that the adoption of electricity is the only solution of the difficulty. The board of directors will be called upon to decide the matter at an early date. Mr. Lewis' plan includes a scheme for acquiring two other short, narrow gauge steam railways which connect with his system. This would give him communication with the interior of the State as far north as Dayton, Ohio, a distance of 59 miles. Whether electricity is adopted on all or a part of this system, it looks as if the Cincinnati, Lebanon and Northern would be the first steam railway to adopt electric motive power.

FIG. 1.—NEW TELEPHONE BUILDING AT CINCINNATI, OHIO.

A New Telephone Building for Cincinnati.

Cincinnati is to have a new and completely equipped telephone building of the most modern type. Arrangements have recently been completed by which the Albany building, a handsome office building at the corner of Vine and Baker streets, almost opposite the new Chamber of Commerce, and in the very heart of the business center of the city, has been acquired. This will be remodeled and two stories added to it. The illustration, Fig. 1, shows the front of the building as it will look when completed. The two stories which will be added to the building will be occupied by the general offices and operating rooms of the telephone company. Part of the building will be rented for offices.

This structure is peculiarly well adapted to the purposes for which it is to be remodeled. It is surrounded by light and air on all sides, having an alley-way 10 feet wide on the north, Baker street, 25 feet wide on the south, Vine street on the front or west, and a wide area at the rear. The building is of modern construction, 50x90 feet in size. The front is pressed brick, with white stone trimmings.

In Fig. 2 is shown the sixth floor plan, which is the first of the stories to be added to the building. This floor will be used for the general offices of the telephone company. It will be seen that ample room is provided for all departments of the business, and that many facilities not usually seen in telephone buildings are provided. The elevator will stop at the sixth floor, leaving the seventh floor, which will be used for the exchange rooms, entirely clear and free.

A plan of the seventh floor is given in Fig. 3. It will be noticed that the exchange room is very large and entirely clear of columns or posts. The windows on three sides of this room are to be unusually high, so that light from them can pass over the top of the switchboards and be utilized in lighting the front of the boards as well as the back. This plan avoids the use of skylights. A glance at the left side of the diagram will show how well Captain George N. Stone, general manager of the company, has provided for the comfort of his employés. Beginning at the rear, there is a ladies' dressing room with an ample number of lockers for clothing, a bath room and ladies' toilet room, a large lunch room, and a reading room connected by sliding doors. The lunch room is equipped with a sink, china closet, and a gas cooking stove. A matron will be in charge of this room and the reading room. It is unnecessary for any of the female employés to leave the building from the time they enter it in the morning until they go home at night. Telephone exchange managers have found in their experience that this plan is conducive to the making of a more efficient staff of employés, at the same time increasing the general *morale*.

Captain Stone has decided to locate the cable terminal room in the basement of the building. Light cables will connect the cables from the subways in the street with the cross connecting board on the seventh floor. It will thus be unnecessary to carry heavy cables up through the seven stories of

cable chute, although this chute is of ample capacity. A series of closets placed above each other on each floor will be made over into a cable chute by cutting out the requisite space in each floor.

The Cincinnati exchange will be equipped with the latest improved switchboards, and will have an ultimate capacity of about 6,000 subscribers. The exchange now has about 3,900 subscribers.

Captain Stone is laying some telephone subways of novel construction in the streets of Cincinnati. Vitrified clay tiles about 18 inches long and five inches square, with a glazed hole 3½ inches in diameter, are used. The conduit is laid up in the following manner: A trench is dug and the bottom rammed. Six inches of concrete is laid down, and on this the first row of tiles is placed set in cement. There is three inches of concrete on each side of the group of ducts forming the subway and three inches on top. This subway starts from the exchange with 126 ducts. About six or eight miles of subway will be laid in the center of the city. "I had to fairly coax for the privilege of putting my wires underground," said Captain Stone, "my pole lines were in such good condition that the city authorities hardly saw the necessity for our going underground." About 2,000 feet of this new single duct can be laid per day. It is said to be cheaper than any other clay tile system, and judging from a number of recent tests, should prove eminently satisfactory. Mr. R. H. Widdicombe, of the Chicago office of the Western Electric Company, has just finished making a number of experiments for the telephone company in the matter of drawing in and out cables through this new duct. He has reported that cables have been hauled, both by windlass and hand power, through sections as long as 460 feet repeatedly and were entirely sound at the end of the experiments; in fact, the cable used in the tests will be laid in the ducts for service.

Captain Stone has adopted an oval shaped manhole, built of brick, laid in Portland cement. The manholes are 8x6 feet, and it is found that the oval shaped walls make the handling of cables much easier than in a square or round shaped hole.

When Captain Stone and his efficient staff have finally completed the improvements mentioned above, Cincinnati will have a telephone exchange equipment of which she may well be proud. Everything will be of the latest and best pattern, and the plant, as a whole, will compare most favorably with those in other large and progressive cities.

Report of the Washington Conduit Commission.

The report of the board, composed of Mr. Andrew Rosewater, Prof. Henry A. Rowland and First Lieut. Francis R. Shunk, engineer corps, appointed by the president under due authority of the District Appropriation act approved August 5, 1890, to consider the location, arrangement and operation of electric wires in the District of Columbia, has been placed in the hands of the president.

The report itself is a long document and it is accompanied by a voluminous mass of charts, tables, diagrams and exhibits of various kinds. The report sketches first, in a general way, the investigations made by the board and the general results of the correspondence of the board with the telegraph companies and others interested.

The following is an approximate estimate of the length and cost of the conduits and manholes comprising the system:

219,300 lineal feet or 41.54 miles 4 duct conduit	$241,230
50,100 lineal feet or 9.49 miles 8 duct conduit	105,210
17,600 lineal feet or 3.33 miles 12 duct conduit	52,800
11,600 lineal feet or 2.20 miles 16 duct conduit	46,400
	$445,640
298,600 lineal feet or 56.56 miles, allowing 10 per cent. for contingencies and supervision	44,564
	$490,204

Total length of ducts, $317\frac{44}{100}$ miles. Cost per mile, $1,548.

"Considering that after construction it will take several years to fill all the ducts, and the cost of maintenance and supervision, we regard seven cents per lineal foot per year for each duct used as a reasonable rental for the first few years."

The estimates contemplate manholes on an average of 300 feet apart. Local conditions will make this a variable factor.

"The cost of manholes also varies with the size of conduits, ranging from $40 to $140 each. The figures given will, in the aggregate, be found sufficiently accurate for purposes of legislative determination.

"Accurate and exact details will necessarily have to be prepared under the supervision of the electrical department after a general plan shall have been determined upon, with special regard to all the governing local conditions of each section of the city.

"In determining the sizes of the respective lines of conduits we have taken into consideration the service already provided for by the telephone and electric lighting companies. The five miles of conduits laid by each of these companies during the year 1891 have been subject to stipulations in the permits hereto appended. We do not regard it unreasonable to require from each of them the free use of one duct in each line of conduit for the public service."

The conclusions of the commission are as follows:

First. In cities overhead wires are objectionable.

Second. Underground wires are practicable for all kinds of electrical service.

Third. Efficient cables for all kinds of electrical service can be manufactured at reasonable cost. Failures of cables heretofore have been due to inferior material, faulty construction or wrong methods of laying.

Fourth. Conductors carrying high potential currents may be placed close to telephone or telegraph wires without interference by induction. To prevent accident, it is well to place the high and low potential conductors in different ducts, and also to use separate manholes or compartments of manholes.

Fifth. It is not advisable to limit the potential of currents. With proper precaution currents of the highest potential may safely be used.

Sixth. Efficient management of electrical matters requires a permanent bureau or department, such as exists in Philadelphia and Chicago.

Seventh. A single subway in the middle of the street is impracticable.

1. Because of its excessive cost.

2. Because it requires connections under the street to the property lines, and so does not do away with the cutting up and repairing of streets.

Where water, gas and sewer pipes are yet to be laid a double subway might be practicable; that is, a tunnel on each side of the street under the sidewalk. When electric wires alone are to be accommodated a system of conduit ducts and manholes, on the "drawing-in" plan, is preferable.

Eighth. As regards the ownership of the conduits, we believe that the interests of the city are best subserved by public ownership, and that the method of having them built by a subway company and renting them to the electric companies would result in great trouble and inconvenience to all concerned.

The commission recommends the following:

First. We recommend the creation of a permanent electrical bureau to supervise all electrical work in the District and to enforce all regulations relating thereto. Its duties should be:

To have charge of the fire alarm and police signal service.

To direct and supervise the construction of electrical conduits, the erection of poles and placing of wires and all other appliances for electrical service by the District government and to inspect the electrical appliances belonging to private individuals or corporations under permits or franchises.

To make periodical inspections and reports of all electrical appliances in the District.

The bureau should consist of a skilled electrician as chief, with a corps of competent assistants. Sufficient salaries should be paid to secure first-class ability. We would recommend a salary of $4,000 per annum for the chief of the bureau; $2,000 per annum for his principal assistant. Since efficiency will require special local and expert knowledge, both of which will increase with length of service, the *personnel* of the bureau should be made as permanent as possible; changes should be made for imperative reasons only.

Second. We recommend that within the limits indicated on the plans submitted all wires should be put underground as soon as possible, and that the District commissioners be empowered to summarily remove poles and wires maintained overhead after due reasonable notice for their removal has been given.

Third. We recommend the rectangular clay circuit, manufactured under the Lynch-Lake patents, believing that it is best suited to the requirements of the district.

Fourth. The telephone and electric light systems being practically underground already, we submit a plan for a conduit system sufficient to accommodate the telegraph, fire alarm and police signal lines of the city, and a reasonable extension of the telephone and electric light systems. The approximate cost of the system proposed will be $490,000.

Fifth. We believe that all conduits should be owned by the city, and, therefore, recommend that hereafter all conduits and subways shall be constructed and maintained by the District government under the direct supervision of the electrical bureau, and that the District government shall, as soon as practicable, acquire the ownership of those already constructed.

Sixth. A reasonable rental should be charged for the use of conduits by franchised corporations or individuals. For the conduits above recommended we think that an annual charge of seven cents per foot per duct would be fair.

Seventh. Should our recommendation as to the public ownership of conduits not be adopted, and should conduits continue to be constructed by franchised corporations, we would recommend that the franchises of such corporations contain an express provision that one or more ducts on each line be reserved for free public use, in addition to such other compensation as may be thought sufficient for the use of the public ground. We further recommend that this provision be extended to the lines conditionally constructed during the past year, and, if possible, to all existing lines.

Eighth. In those parts of the District, where, for reasons of local expediency, overhead wires may be deemed admissible by the electrical bureau, we recommend that the poles be erected and owned by the District, and that rent, to be determined by the electrical bureau, shall be charged for their use.

Accompanying the report the board submits a set of rules and regulations governing the construction and use of conduits, poles, wires and all other appliances for electrical service in the District of Columbia.

These require yearly reports from corporations as to number and location of wires, etc., and weekly reports of changes, connections and repairs. Linemen are required to wear numbered badges.

Provision is made for inspections, for the branching of cables and wires at manholes, the prompt removal of dead wires and prompt repair of damaged wires.

Poles, where considered necessary, are to be put in position and maintained at the expense of the District, and a rent charged for their use by others. A number of rules are made as precautions against danger from high potential wires.

Wires carrying currents at a potential above 500 volts are to be painted bright red by the person or company owning them, wherever visible, as a signal of danger, and the lead coverings of such cables in public manholes are also to be so painted.

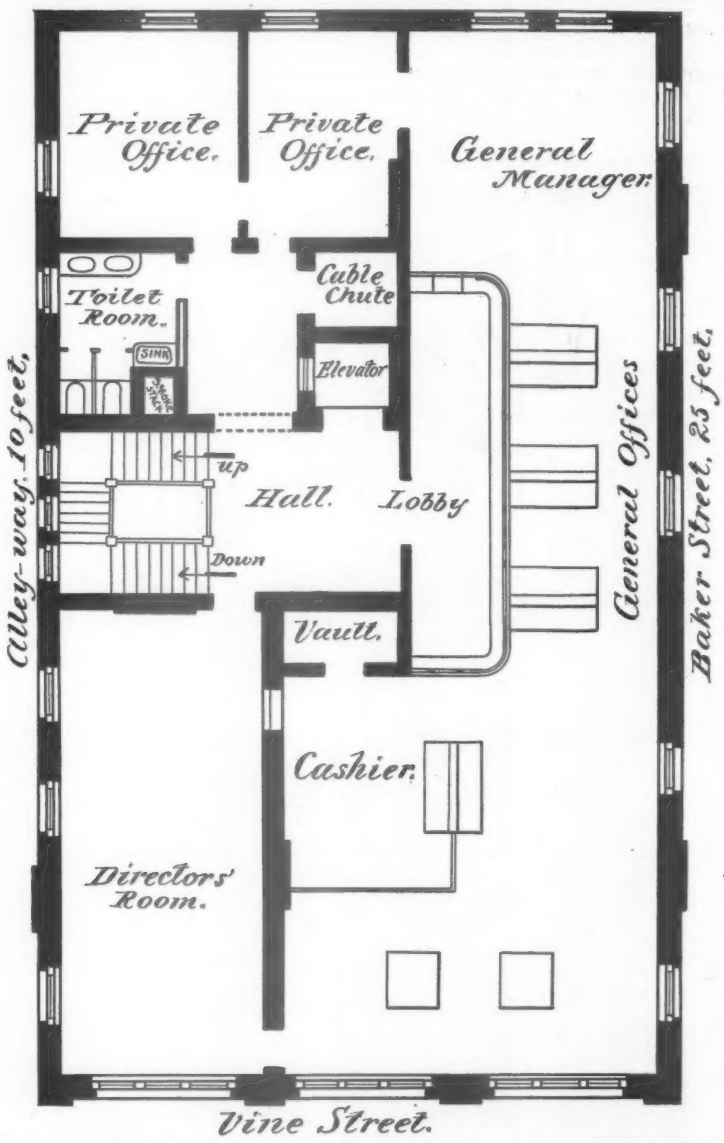

FIG. 2.—SIXTH FLOOR OF NEW TELEPHONE BUILDING AT CINCINNATI, OHIO.—PLAN OF GENERAL OFFICES.

New Electric Power House at Memphis.

The power house of the Citizens' Street Railway electric lines, at Memphis, Tenn., is rapidly nearing completion outside and in the boiler room. The steam plant will consist of three Hazelton tripod boilers of 500 horse-power each.

The boiler room is separated from the engines and dynamos by a brick partition wall. There will be five engines, each of 250 horse-power, manufactured by A. L. Ide & Son, Springfield, Ill.

The electrical equipment will consist of five Edison generators of 250 horse-power each. The switchboard, 15x20 feet, is of dark, chocolate-colored Tennessee marble, highly polished. The switches are reset on a lighter shade of Tennessee marble. The cable and wire work is all concealed.

Forty-Mile Electric Road.

WHAT HENRY VILLARD THINKS OF THE POSSIBILITIES OF ELECTRICITY.

Henry Villard, who is making a tour of inspection over the Northern Pacific, reached Seattle, Wash., a day or two ago. To a correspondent of the ELECTRICAL REVIEW he said:

"I am a great believer in electricity, and I think that to set a limit to the application of electrical power is almost impossible. I expect that within 10 years trains on roads over which there is a heavy passenger traffic will be impelled by electricity. That is, electrical trains will be running between New York and Boston, New York and Philadelphia, Philadelphia and New York, etc. I believe that before long electricity will be found the cheapest motive power for such traffic, though the running of freight trains by that power is not quite so certain.

"I am interested in the subject, and I intend to try some experiments in running trains by electricity; but, of course, no system would be introduced in a long line like the Northern Pacific until there had been very thorough tests over shorter distances. I expect that electrical trains will be running between here and Tacoma before they will run on the overland line. Perhaps some day I shall myself build an electrical road between here and Tacoma—not tomorrow or next week, but some day."

If Mr. Villard does not hurry up an electrical road will be built before he gets to work, for L. H. Griffith, who has organized the electrical railway system of Seattle, has formed a company to build a line. H. W. Wheeler, W. T. Chalk, B. F. Shaubut and J. F. Hale, are associated with him in the enterprise—all of them men who have made money out of the Seattle roads. The line as projected will be about 40 miles long. A preliminary survey has already been made, and the plan is to follow the country road down through the valleys between here and Tacoma to Edison, about 12 miles this side of the terminal. There connection will be made with R. F. Radebough's Tacoma and Puyallup railroad. The latter is now operated by small steam motors but electricity will soon be put in. There are a number of small settlements between here and Tacoma which will supply freight and passenger traffic for the line. Many of the farmers are interested in the project for it will supply them with cheap facilities for shipping their milk and vegetables to Tacoma and Seattle. The heavier shippers will have switches built into their yards. The enterprise is attracting considerable attention for it will do much to develop the country lying between the two cities. H. L.

Seattle, Wash., November 5.

The Electromathean Society.

The Electromathean Society is an organization newly formed at Grand Rapids, Mich., for the study of electricity. Its president is C. W. Carmen and it has already 40 members.

A New Steam Engineering Company.

Mr. A. M. Morse, until recently of the firm of English, Morse & Company, Kansas City, Mo., has removed to St. Louis, Mo., with offices in the Commercial building, corner Sixth and Olive streets. During the eight years that Mr. Morse has been located in Kansas City he has gained a wide and favorable acquaintance among the steam users of the Southwest, and has designed and furnished a liberal proportion of the representative steam power plants in that section for electric lighting, electric railways, flour mills and manufacturing purposes.

The business in the future will be conducted under the style of A. M. Morse & Company, who will represent leading manufacturers of high grade steam engines, both Corliss and high speed type, also improved boilers, steam pumps and other specialties, which go to make up complete steam power plants. They will offer only the best class of machinery, at manufacturers' prices, and will make a specialty of designing and furnishing complete steam power outfits for any service, and the improvement and extension of plants already established.

Artificial Rain-Making.

Prof. Edwin J. Houston recently read a paper before the electrical section of the Franklin Institute under the above title.

"A circumstance that appears to have been lost sight of in all the recent attempts at rain-making," says Professor Houston, "is that such attempts have been apparently made regardless of the hygrometric conditions of the air. As rain is but the excess of moisture, which the warm moist air when sufficiently cooled is unable to retain, the amount of the fall will depend, as already stated, on the quantity of moisture in the air as well as on the extent of the chilling action following the explosion or other cause. To attempt to produce rain by explosions in mid-air, irrespective of the quantity of moisture in the air, is to attempt to cause water to fall from the air when practically none is present. This is not only illogical but absurd.

"Though lightning is not a cause of rain, there can be no doubt that if rain can be artificially produced during a period in which there is much free electricity in the air the storm will be attended by lightning and thunder. If, then, there be any increase of rain due to the presence of lightning, artificial rain-making will be more liable to succeed when the potential of the air, as regards the earth or neighboring clouds, is comparatively high.

"The following general conclusions may, in view of the present state of meteorological science, be properly drawn concerning the artificial production of rain:

"(1) That rain can never be made to fall at will by mid-air explosions on any part of the earth's surface, irrespective of the climatic conditions there existing.

"(2) That during certain meteorological conditions, mid-air explosions may result in rainfall over extended areas.

"(3) That the liberation of energy necessary for such rainfalls is due not to the mid-air explosions, but to the energy stored up in the moist air from which the rain is derived.

"(4) That the meteorological conditions which must exist for the successful action of mid-air explosions would probably, in most, though not in all cases, themselves result in a natural production of rain.

"(5) That a comparatively high difference of electric potential between different parts of the air, or between the air and the earth, is possibly favorable when taken in connection with other meteorological conditions for artificial rain-making.

"(6) That an undirected mid-air explosion is not as likely to produce rain as an explosion in which the main tendency of the energy liberated is to cause a general uprush of the air."

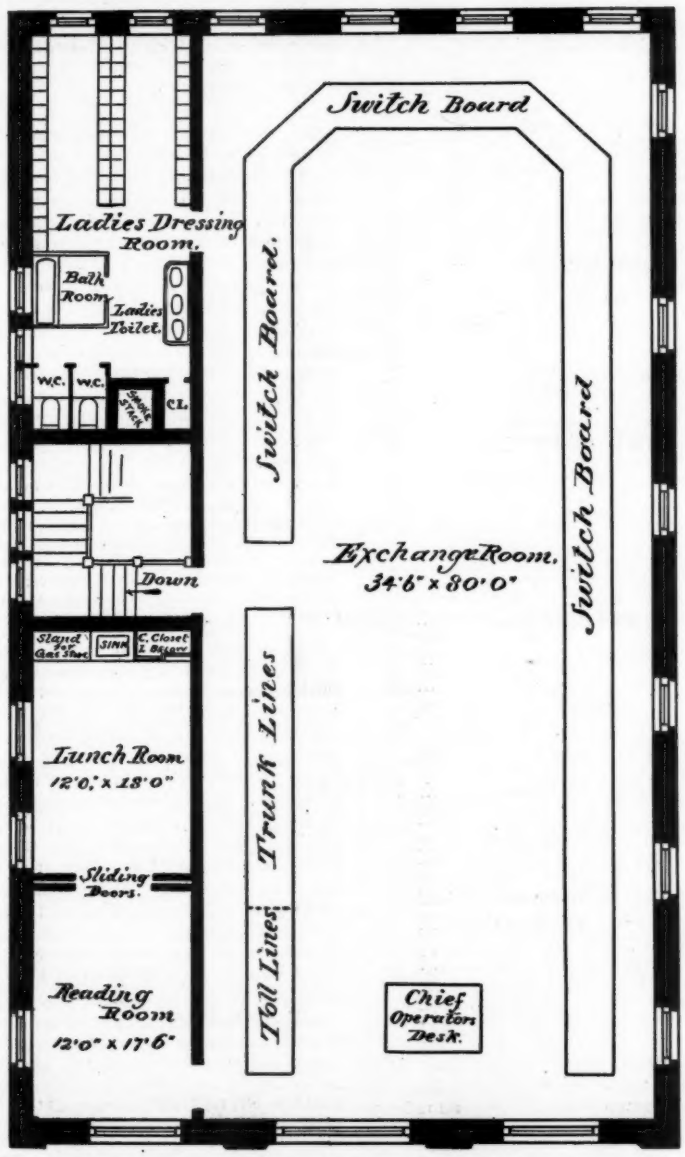

FIG. 3.—SEVENTH FLOOR OF NEW TELEPHONE BUILDING AT CINCINNATI, OHIO.—PLAN OF EXCHANGE ROOMS.

The city council of North Platte, Neb., has been petitioned to light the streets by electricity. A majority of the residents are said to favor it.

The Gray Electrical Company has made surveys for locating its plant at Idlewild, two miles south of Highland Park, Ill. Plans for a main building, 60x140 feet, have been completed. This company purchased 50 acres of land for $25,000. On this tract the plant will be built. The entire 50 acre tract will be laid out as a park. The factory buildings have been made highly ornamental. Through the grounds will be located homes for the employés, to number about 100.

Paterson, N. J.—The Central Electric Railway Company; capital, $30,000.

Jersey City, N. J.—New York Electric Construction Company; capital, $100,000.

Chicago, Ill.—Gray Electric Company, to manufacture telautographs and electrical instruments; capital, $100,000.

Chicago, Ill.—Marion Manufacturing Company, to manufacture electrical and mechanical devices; capital, $20,000.

Milwaukee, Wis.—The Gothenburg Water Power and Investment Company, to construct irrigating ditches, electric street railways, etc.; capital, $2,500,000.

Walton, N. Y.—The Walton Electric Light Company; capital, $20,000. Promoters, John Babcock, Charles B. Bassett and Samuel H. Francher, all of Walton.

Marshalltown, Ia.—Marshall Electric Light Company; capital, $60,000. Promoters, J. M. Parker, B. E. Surry, T. L. Seevers and George Martin, all of Marshalltown.

Cumberland, Md.—The Cumberland Electrical Company, previously reported as incorporated, and as to lease and operate the Gephardt foundry as electrical works, has organized with J. S. Humbird as president, and C. Pease vice-president and manager. The capital stock is $100,000.

New Steamers for the Providence and Stonington Steamship Company.

The building of two new steamers by the Providence and Stonington Steamship Company, to run on their Stonington Line, is an event of much interest, not only to the traveling public, but to all who are in any way interested in marine architecture, as these steamers present many novelties in type and plan, and are the result of much thought devoted to the question of the best type of vessel to run on great inland bodies of water, such as Long Island Sound.

The size of these steamers, the advantage of their plan and equipment, their arrangements for speed, comfort and safety, the magnificence of their interior fittings and decorations, will, all combined, make them the finest vessels of their kind afloat.

The first of these vessels, the "Maine," was launched at Harlan & Hollingsworth yard at Wilmington, Del., on October 31, and the second, the "New Hampshire," will be launched in about three weeks.

The design of these steamers, though modeled somewhat on the plan of the new propellers now running on the Potomac River, is largely the work of Mr. J. W. Miller, the president of the Providence and Stonington Steamship Company, and they have been built under the immediate supervision of Mr. S. J. Clarke, the superintendent of the company.

To begin with, these boats are steel propellers, in itself a great innovation on Long Island Sound, where the side-wheeler has held sway so long.

Their general dimensions are: Length on water line, 302 feet 7 inches; length over all, 310 feet; beam moulded on load water line, 44 feet; width over guards, 60 feet; draft, 12½ feet. The steamers will be lighted by electricity, about 600 lights being installed on each vessel, side and stern lights being also electric, and a search-light will be mounted upon the pilot house.

These fine vessels will be finished next May, and will take their places on the Stonington Line at the opening of the next Summer season.

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Burton Electric Co	xvi
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Central Electric Co.	iii
Church & Sleight	ix
Claflin & Kimball	x
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Crocker-Wheeler Electric Motor Co.	xvi
Crosby Steam Gage & Valve Co.	viii
Dixon Crucible Co	v
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Electro-Light Engraving Co.	xvi
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Eureka Tempered Copper Co.	iv
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The Ohio State Tramway Association holds its annual meeting in Akron this week. Electric power as applied to street railways will be the chief topic of discussion.

In our last issue we mentioned the eminent electricians whose names have been selected to ornament the electricity building at the World's Fair. In this issue will be found a communication relating interesting anecdotes of each of these famous men. The article is from the pen of Dr. P. H. van der Weyde, the venerable and erudite scientist who is so well known to readers of the ELECTRICAL REVIEW.

"All work and no play makes Jack a dull boy." This was the very good reason for the recent celebration of a "Wurzburger Nacht" at the New York Electric Club. The complete success of that affair, as the many requests for "more" have attested, has led the entertainment committee of the Club to decide upon having similar affairs at intervals. The death of the old year and the birth of the new will probably be celebrated in a befittingly unique way. The young men and the old men of the electrical fraternity need relaxation and the Electric Club proposes that they shall have it.

Our Seattle correspondent gives some very interesting information in this issue about a 40-mile electric railway for passengers and freight which is projected to run between Seattle and Tacoma, Wash.

Secretary Hornsby's report of his European tour in the interests of the World's Fair department of electricity, which appears on another page, will be found very interesting. Mr. Hornsby was received abroad in a manner befitting his official position, and his careful observations will undoubtedly be of great benefit to his department.

The Commissioner of Public Works of New York city warns us that unless there is a copious rainfall in the Croton water shed, which is the source of the city's water supply, we will have a water famine. This is a peculiar state of affairs in view of the wonderful results reported by the government's rain-makers in far-off Texas. Let's give them a trial here.

Mr. W. J. Arkell, of *Judge*, introduced Mr. W. Wilde to a number of prominent New York editors in a delightful little dinner at the Gilsey House Friday evening of last week. The guest, who one month ago came from across the sea and captured the heart and hand of Mrs. Frank Leslie, is a London journalist of high reputation, and his cultured and graceful speech, following Mr. Arkell's pleasant introduction, won for him the respect and friendship of every one present. Mr. Wilde will remain in this city and true journalism will be the richer for his coming. Among the gentlemen present, nearly all of whom spoke a kind word of greeting to Mr. Wilde, were: Chester S. Lord, Arthur Bowers, James F. Graham, Bernard Gillam, P. Farrelly, John A. Sleicher, W. J. Merrill, Carson Lake, Charles W. Price, E. B. Phelps, Thomas Evans, Bart. Arkell, Senator Henry D. Winton, of New Jersey; T. Hamilton, W. A. Sweetser, Russell Harrison, Senator W. L. Brown and W. J. Arkell.

About a year and a half ago the president, by the authority of Congress, appointed a commission, composed of Prof. Henry A. Rowland, Mr. Andrew Rosewater and Lieut. Francis R. Shunk, to investigate the subject of subways in the city of Washington and municipal ownership of certain enterprises. The commission has completed its labors and delivered its report to the president. The president will send the report to Congress, which will order it to be printed for public use. The report exhausts the subjects of the investigation, and it will be of great interest to every one interested in water works, gas works, electric light plants, street railways, telephone exchanges, telegraph stations, and like enterprises. The report takes the broad ground that some of these enterprises ought to be actually owned and operated by the cities, and the others, such as rapid transit lines, telegraph lines and telegraph exchanges, ought to be controlled by the municipalities, the use of the bed of the street to be rented to the highest responsible bidder. This is a very advanced position to take. The report has a distinct flavor of Nationalism.

A BELGIAN ELECTRICAL COMMISSIONER VISITS US.

Mr. William Dierman, an electrical and civil engineer, of Brussels, Belgium, arrived in New York about 10 days ago. Mr. Dierman is a commissioner appointed by the Belgian government to visit the United States for the purpose of observing and reporting upon the progress we have made in electrical matters.

"I am most pleasantly impressed with New York," said Mr. Dierman, who speaks English fluently. "I have already seen and talked with a number of your prominent electricians, including the brilliant Mr. Tesla. I think the Madison Square Garden and its lighting effects one of the grandest spectacles I have seen."

Mr. Dierman spent several days of last week in Boston and Lynn, where he met Prof. Elihu Thomson and Mr. Rice, and inspected the Thomson-Houston factories.

THE FRANKFORT TEST.

After going to press last week the REVIEW received the following cablegram from its Frankfort correspondent in relation to the insulation in the long distance power circuit between Lauffen and Frankfort: "Success! 27,000 volts." The line was designed to carry 25,000 volts, and its ability to safely carry 2,000 volts higher electromotive force indicates the excellence of the plan of insulation adopted by the engineers. We understood the electromotive force of the line current was to be raised until the insulation gave way. We have, as yet, received no advices of attempts to carry still higher voltages, but doubtless they will be made in the near future. There is no doubt that the improvements in insulation exemplified in the building of the line are of great importance. Several of our contemporaries, British and American, speak slightingly of the results of the multiphase principle of transmitting power, and are disposed to award all the credit to Mr. Brown, to whom is attributed the insulation improvements. Both steps are important and they must go hand in hand, but the order of ingenuity displayed in the multiphase system of transmission, and especially the transformation of a few currents of differing phase into a multiplied number of currents of differing phase, is to our mind of a much higher character than that exercised in making an oil insulator. The chief merit of the multiphase system is that it increases the percentage of power returned for energy expended. The exact ratio of increase has not yet been determined, but Mr. Dobrowolsky has asserted that over 80 per cent. efficiency is attained with only 40 per cent. more copper than would be required for a single circuit. If his assertions are well founded, his efforts deserve the highest praise. He has not only given us an alternating current motor which will start under load, but one which, according to his own figures, rivals the direct current motor in efficiency, and to accomplish this result he has done some brilliant inventing. The multiphase transformer is one of the cleverest things done for years in electricity; only gray matter of the finest texture could evolve it. To be frank, it must be admitted that Dobrowolsky has done a great thing.

ANNOUNCING ELECTION RETURNS BY SEARCH-LIGHT SIGNALS.

As the election returns were received during the evening of November 3, the results were announced by search-light signals in New York and Boston. The New York *Herald* used the powerful light on the tower of the Madison Square Garden.

When Fassett seemed to be winning, a brilliant pencil of light pierced the western gloom. If Flower's figures were in the ascendant, the eastern heavens were illumined. The light shone east so much that roosters crowed, thinking day had dawned. This saved the Democratic party the expense of hiring imitation roosters.

The New York *World* used its own search light on top of the lofty Pulitzer building, by the bridge. A more elaborate code of signals was used here, consisting of long and short flashes of light. Jerseymen and Long Islanders could read the signals easily.

The Boston *Post* also issued a sky edition during the evening. The *Post's* signals gave information of the returns in Massachusetts, New York and Ohio. When it was learned that Russell had won in Massachusetts, the *Post* stabbed the zenith with a perpendicular ray of light for ten minutes. Large Democratic yells could be noticed floating up from the earth in the beam of light like motes.

There have been recently reported a number of serious accidents caused by the failure of brakes on electric cars. The braking of the heavy cars now used on so many electric roads is a most important matter. The proper officials should see to it that brakes of sufficient power and correct mechanical construction are used.

CORRESPONDENCE.

OUR LONDON LETTER.

Electric Lighting in the Strand.—Messrs. Woodhouse & Rawson have received an order to fit the premises of the well known electrical and engineering publishers, Messrs. E. & F. N. Spon, in the Strand.

The Institution of Electrical Engineers' Dinner.—The third annual dinner of the Institution will take place at the Criterion Restaurant, Piccadilly, on Friday, November 13. A large gathering is expected.

South Africa.—The desire for electric lighting is spreading, and a number of private plants in Pretoria are to be lighted early in April next. The installation is in the hands of Messrs. Crompton and Company, I am informed.

The Parish Church, Hove, Brighton.—Under the superintendence of Messrs. Morgan, Williams and King, a complete installation of electric lighting plant has been erected at the new parish church, Hove, Brighton, the church having been designed by Mr. J. L. Pearson, R. A.

Frankfort International Electrical Exhibition.—After being open just over five months the exhibition closed on the 19th inst., showing a most successful career. The principal object, the practicability of utilizing very high tension current for the long distance transmission of electrical energy, has been fully demonstrated. The success of the 20,000 volt plant from Lauffen on the Neckar, to the exhibition, a distance of 108 miles, opens up a great future for the transmission of electrical energy over very considerable distances, and for that result alone the Frankfort exhibition will long be remembered.

Train Electric Lighting.—On one of the express trains between Berlin and Frankfort the lighting is done by electricity. Each carriage is furnished with two batteries of accumulators and the lamps fed off two distinct circuits, so that in case of accident one battery will still supply light. The cells are specially constructed to stand rough usage and have a capacity of 200 ampere hours. Each battery supplies current for four lamps of 8 candle-power for the carriages, and one 5 candle-power for the lavatory. The batteries are placed beneath the floor of the railway carriage and weigh six hundredweight each.

The Palace of the Empress of Austria at Corfu.—From the *Electrical Engineer* I glean that the International Electric Company has just completed the electric arrangements in the villa of the Empress at Corfu. The house and large gardens are lighted by electricity, the lamps and lustres being adapted to the Pompeian style of the house. In the interior, incandescent lamps are used, and for the terrace and a portion of the landscape around, large Swan lamps are used. A perfect network of telephones and signals connects all portions of the house and gardens with the town, and the yacht "Miramar," which is at anchor in the port.

The Crystal Palace Electrical Exhibition.—Firms of the highest standing in the electrical world, and covering almost every department of its various branches, have already sent in applications for space. As I before told you, it is to be opened on the first of January next and will form a complete record of the last ten years' electrical progress. Over 200 requests for space have already been sent in, including lighting plants for country and town houses, steamships, mines, railway trains and for private carriages; all the newest forms of motors, generators, accumulators and their machinery employed for the production and storing of electricity. In addition to the exhibits of all the leading electrical and engineering firms of Great Britain, several of the most important representations are to be transferred from the Frankfort Exhibition.

The Gulcher Electric Light Company.—The last six months shows an enormous advance in the working of this company. In New Zealand, where their managing director, Mr. de Castro, has been making a long visit, a large extension of business has resulted. For the city of Genoa, an order for a central station with plant for a first installment of about 2,600 incandescent and 60 arc lamps has been secured and will very shortly be in operation. In London, among other large orders, contracts have been received for the lighting of the People's Palace at Mile End Road and for the lighting of Modern Venice at Olympia, West Kensington. The company is now in a more flourishing condition than ever before, and the result is, no doubt, in a great measure, due to the large installations at the Earls' Court Exhibitions and the very energetic manner they were managed. CHARLES FFRENCH.

London, October 26.

OUR CHICAGO LETTER.

Mr. W. P. Reed, general superintendent of Salt Lake City Railroad Company, stopped in Chicago on his return from a trip East on business.

Mr. Ernest Fahrig, electro-chemistry expert from London, England, arrived in Chicago this week, and will be located at No. 67 Randolph street.

Incorporated.—Electro-Medical Appliance Company, of Chicago, to manufacture electro-medical appliances. Incorporators, Robert Pryor, A. A. Hall, F. D. Thomason. Capital, $50,000.

Mr. F. X. Cicott, who for some time past has been connected with the Electric Merchandise Company, has resigned and sails on the 11th inst. for London, England, where he will publish a monthly periodical entitled *Tramway and Railway World*. Mr. Cicott will be ably assisted by A. M. Willcox, who was recently connected with *Electrical Industries*. The many friends of the above gentlemen will wish them success in their new venture.

The Electric Appliance Company, Chicago's new electrical supply house, will open its doors to the electrical trade about November 15. The officers of the new company are veterans in the electrical supply business, representing a combined experience of nearly 20 years. This alone is sufficient guarantee that any business entrusted to them will receive intelligent attention. The officers are: Willard H. Low, president; Harry B. Gilbert, vice-president; Thos. I. Stacey, secretary and treasurer. The names of all these gentlemen are so familiar to the electrical supply trade that they need no introduction. The company has secured the large and splendidly located building at 242 Madison street, and will soon be in position to meet any demands that can be made upon an electrical supply house, and meet them with a promptness that will be welcome to the trade in general. M. J. B.

Chicago, November 7.

OUR BOSTON LETTER.

The Wright Electrical Engineering Company, this city, will have its stock listed on the Boston Exchanges about January 1, 1892.

The Electric Railway now being built at Biddeford, Me., is being rapidly pushed toward completion.

Mr. Isaac H. Davis, of the Westinghouse, Church, Kerr & Company, was in the city for a few days this week.

Mr. Chas. E. Lee has been appointed manager of the Electric Gas Lighting Company's Chicago branch office.

The Gould and Watson Company, this city, contemplates enlarging its factory and increasing its manufacturing facilities to ensure prompt filling of orders.

The Walworth Light and Power Company, this city, recently added to its power plant the Walker smoke consumer, and the results so far demonstrated are satisfactory.

The New England Telephone and Telegraph Company is putting its wires underground in Portland, Me. The company predicts that this work will be complete before December 1.

Sewell's Falls, N. H., is to be utilized at an early day as the source of power for operating a large plant at Concord, N. H., for electric transmission to points in and around the city named.

The National Telephone Manufacturing Company, this city, has recently installed several of its instruments (acoustic) for the Old Colony Railroad Company, which are giving satisfactory service.

Mr. T. F. Peckham, a traveling representative of the well known belting manufacturers, the Grafton & Knight Manufacturing Company, of Worcester, Mass., favored this office with a visit to-day.

The Charles A. Schieren and Company, through their New England agent, Mr. G. H. Hamblett, have recently filled several large orders in this section for their well known "perforated electric" and regular oak belting. These orders were from the following: Somerville, Mass., Electric Light Company, Cambridge, Mass., Electric Light Company, Edison Electric Illuminating Company, Fall River, Mass., and the Lee, Mass., Electric Light Company.

The Gethins Electrical Company, this city, report that "its business during four weeks past has exceeded that of any previous month." Among the recent large orders filled by the company was one for a large and wealthy concern in India, the plant consisting of Gethins primary batteries, storage cells and small motors. The Gethins company has recently placed a large number of its batteries in Cambridge, Mass., to be used for police signal work.

New Storage Battery System.—The experiments being made in Hartford, Conn., with the Barrett storage battery car are proving quite successful. The car was, a day or two ago, taken off its regular trip between Hartford and Wethersfield and put on the city route. It made the round trip in an hour, against an hour and a half, the usual running time of the horse cars. One of the difficulties encountered in making the experiments has been to control the motion of the car on rainy days. W. I. B.

Boston, November 7.

EMINENT ELECTRICIANS.

FACTS ABOUT FAMOUS MEN WHOSE NAMES WILL ADORN THE ELECTRICITY BUILDING AT THE WORLD'S FAIR.

I have been requested by the Editor to write a short notice about each of the eminent electricians not now living, whose names will be placed on the electricity building at the World's Columbian Exposition in Chicago, according to the decision of the committee on electricity, electrical and pneumatic appliances. I have attempted to write in each case something interesting, not generally known.

P. H. VAN DER WEYDE.

I

Franklin—Benjamin; born 1706; died 1790. He was the first to suppose that lightning was an electric phenomenon and identical with what was then produced by friction of revolving glass globes. He demonstrated, practically, with his celebrated kite, that this was really the case. He wrote an account of his experiments to a scientific friend in England, and when this friend brought it before the Royal Society, the members hooted the ideas, made sport of them, laughed, and would not print them. The friend then brought the account to the editor of the *Gentleman's Magazine*, who printed it, making a sensation and he sold five extra editions. A copy of them was seen by Buffon, who at once caused it to be translated and published in France. Franklin's kite experiment was repeated and performed before the Royal Court in Paris; then the Royal Society in London felt ashamed at their former action, published Franklin's account in their translations, and elected Franklin an honorary member.

His other electric achievement was to originate the doctrine of a single electric fluid, of which all matter possessed a certain quantity, and which, when increased or diminished, showed the electrical phenomena, hence the signs of plus (+) and minus (−) generally in use, even by those who teach the existence of two kinds of electricity.

Faraday—Michael (1791–1867); English chemist and electrician; began life as a journeyman bookbinder. A customer took him to some lectures of Humphrey Davy; he took notes which were later shown to Davy, who then recommended him to be appointed as his assistant, and 20 years later he became professor of chemistry. He made many chemical experiments by means of the voltaic pile, and by using a current of great quantity he found how to rotate a magnet around a wire, and *vice versa*, which was a consequence of Oersted's discovery. Finally, he discovered the laws of induction, according to which an intermittent or fluctuating current will generate a similar current in parallel running wires, and that when a wire carrying a current is moved near another wire it will generate a current in this wire, or when any wire is moved in the vicinity of a magnet, currents will be generated in the wire. This was his crowning discovery and the principle upon which the modern dynamo is constructed.

Ampère—André Marie (1775–1836); French mathematician, physicist and electrician. As soon as he heard of Oersted's discovery about the influence of an electric current on a compass needle, he investigated further and soon came to the discovery that two parallel wires conducting currents will attract one another if the currents run in the same direction and repel when in opposite directions. Next he made solenoids of coiled copper wire, which, when a current was made to pass through them, behaved exactly like magnets, proving that magnetic effects can be produced by electricity; in this way he founded the branch called electro-magnetism. As he chiefly experimented with currents of great quantity, his name has very appropriately been selected for the unit with which electric quantity is measured. He also made, in 1821, an electric telegraph with 24 wires.

Arago—Francois, J. D. (1786–1853); French physicist. Notwithstanding his greatest discoveries were made in the field of optics, he has very largely contributed to the progress of electric science. He proved the daily and hourly motion of the compass needle and its connection with the aurora borealis as electric phenomena, he was first to magnetize steel by the electric current, and the first to note the effects of strong magnetism upon a beam of polarized light, while he contributed most powerfully to the adoption of the transverse wave theory.

He edited for about 20 years scientific notices in the Annals of the Board of Longitude, which among scientific circles on the European continent are still pointed to as models of most clear and elegant French, fully worthy of study and imitation. His success as a lecturer was without parallel, hearers were always fascinated by his graceful eloquence and clearness of explanation. The writer had the good fortune to hear him give a lecture in Brussels, the capital of Belgium, in 1884. Being introduced to him after the lecture, and thanking him for the benefit I had derived from his yearly scientific notices in the Annals of the Bureau des Longitude, and especially from the lecture I had just heard, he expressed as his opinion that to speak distinctly and explain matters clearly was "simply a duty of politeness to an audience," in fact, he always appeared to watch the facial expression of some among his hearers, as it to convince himself conscientiously if he was well understood. When, 40 years ago, I occupied rooms in the New York University, and frequently went to hear the eminent John William Draper lecture before his class of students, I once told him that his style of explanation reminded me of Arago, he answered that this was "the greatest compliment he had ever received in his whole life." This shows the estimation in which Arago was held by his fellow scientists.

Coulomb—Charles A. (1736–1806); French mathematician and physicist. His main pursuit was military engineering, to which he joined surveying also in the West Indies. In this way he became interested in the compass needle, so important in all surveyors' instruments and for ocean navigation. He improved this, and when the Academy of Sciences promised a gold medal for a treatise on the best construction of compasses, he competed and obtained the prize, which, however, was also given to Van Swinden, a Hollander, whose treatise was considered of equal value. His merit in the field of electricity was the invention of the torsion balance, which is so delicate an instrument that even the small amount of gravitating attraction of a mass of, say, 1,000 pounds can be not only observed, but measured, and so the weight of the whole earth determined by the simple rule of three. He also made the torsion balance of the utmost importance for delicate electric measurements, wherefore the "coulomb" has been accepted for the name of the unit of the quantity of current which a battery or dynamo will deliver per second.

About his useful life we may mention something which will astonish Americans, namely, that he was put in prison in 1782, for the reason that he advised against a project proposed by the Royal government for the canalization of the French province of Brittany, where he was sent as Royal Commissioner to make a topographic survey of the locality. He found that the difficulties to be overcome were so great that the cost of the canals would far surpass their practical value and become a burden to the estates at the cost of which they were to be constructed. In fact, the scheme was a kind of Suez Canal project on a small scale. However, he remained firm in his opinion, notwithstanding his imprisonment. When at last the Royal government came to its senses and liberated him, the estates showed their appreciation of his firmness by presenting him with a very valuable watch, especially made so as to be adaptable to scientific experiments. He enriched scientific literature with several treatises on magnetism and electricity.

Wires Blamed Again.

John Appleby, aged 50, night fireman for the Excelsior Electric Manufacturing Company, whose works are at Willoughby and Navy streets, Brooklyn, was found dead in the boiler-room last Saturday. It is said that an electric shock was responsible for his death, although no marks to indicate that fact were found on his body, and his duties did not lead him into dangerous proximity with any live wires. A full investigation will be made.

A New Weatherproof Wire.

It will be of especial interest to the electric lighting industry to learn that the Benedict & Burnham Manufacturing Company, of Waterbury, Conn., have brought out a new weatherproof wire of exceptional quality. This new wire has been subjected to very severe tests by a number of experts connected with the large electric lighting companies, and every report is in the highest degree complimentary. The Benedict & Burnham Company manufacture this wire entire, prepare the insulation and put it on under the same careful and thorough management that has given their name such wide renown in the past.

From the favorable remarks that have already been heard for this wire from practical men in the field, the REVIEW believes that the Benedict & Burnham Manufacturing Company is to congratulated on the success attained after the many months of experiment and testing that were necessary before the new wire could receive that company's endorsement.

Telephonic News

*** The telephone exchange at Peoria, Ill., is to be improved.

*** A new telephone cable was laid last week between Detroit and Windsor.

*** The Hudson River Telephone Company is about to put new telephones in Middletown, N. Y., to replace the old ones.

*** The Sunset Telephone and Telegraph Company, of San Francisco, is extending its toll line system throughout California.

*** The manager of the telephone system at Albany, N. Y., has instructed his operators to enforce the rule prohibiting non-subscribers from using the telephone.

*** The Southern New England Telephone Company claims it has beaten all records by laying, last week, at Bridgeport, Conn., 21,500 feet of underground wire in six days and five nights.

*** About the first of the year Brussels, Belgium, and Amsterdam, Holland, 125 miles apart, will be connected by an international long distance telephone line. The line will pass through Antwerp and Rotterdam.

*** A year ago Vicksburg, Miss., got along with little more than 200 telephones. At present 255 are in daily use and even these are not enough, there being numerous applications for others. The service has been greatly improved by Manager W. H. McCulloch, who is now in charge of the Vicksburg Exchange.

*** The American Bell Telephone Company's instrument output for the month ending October 20, was as follows:

	1891.	1890.	Increase.	Decrease.
Gross output..	5,272	5,378	.....	106
Returned	4,224	2,205	2,019	
Net.....	1,048	3,173	.. .	2,125
Since Dec. 31.	1890-91.	1889-90.		
Gross..	59,220	53,787	5,433	
Returned.....	35,573	22,315	13,258	
Net..... ...	23,647	31,472	.....	57,82

*** On November 3, the Chicago Telephone Company opened a long distance telephone line from Chicago to Oshkosh, Wis., a distance of 175 miles. A test of the line took place in the general offices of the company, at Franklin and Washington streets, in the presence of representatives of the press, under the direction of Manager Buck and Superintendent Nichols. The test was an unqualified success, and insures the extension of the long distance telephone system thus inaugurated.

*** Fred. Volk and Peter Boyd, linemen employed by the Acoustic Telephone Company, were arraigned in the Court of Special Sessions, New York city, last week, charged with violating the law in stringing wires from house-tops without permits from the Board of Electrical Control. The case was a test one, there being a dispute between the telephone company and the board about the meaning of the law under which the charge was brought. The telephone company argued that their wires were not electrical wires and that their system required no electric current. The law, they said, covered all electrical wires, but said nothing about non-electric wires. So they claimed the right to string their wires without recourse to the Board of Electrical Control. The decision of Justices Kilbreth, Ryan and Divver was that the meaning and intention of the law was toward all wires, whether electrical or not. The linemen pleaded guilty and were fined $5 each.

Western Union Office Burned Out at Louisville.

The Western Union operating room, situated in the tower of the Board of Trade Building at Louisville, Ky., was burned out at five o'clock A. M. November 8. The fire was caused by lightning and did $25,000 damage. Connections were restored before night.

The Telephone Girl will be Missed.

The news that the telephone girl will have to go will be received with mingled emotions on the part of the public.

Somebody has invented a thingumbob with an automatic dingus which renders the lovely creature a superfluity and she will have to give way. But she will be missed.

The fresh young man who goes to the 'phone with a languid, pick-me-up air, seizes the ear-piece and says, "helloolleelleeloo" will miss her. That kind of talk will be wasted on a hollow cylinder.

The youth who calls for Maggie in a voice that would melt tar will miss her. You can't flirt with electricity.

The man who always calls for the manager will miss her. You can't reason with the dull, insensate ear of a battery.

The man who has told her four times in thrilling and distinct tones the connection he desires, who has waited half an hour for the fulfillment of his hopes and who hears that liquid voice break the silence with "What number do you want?" will miss her.

The man who pours a stream of frightful language into the transmitter while he

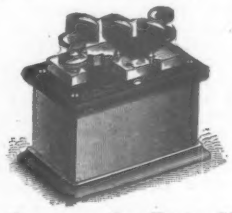


FIG. 1.—STANDARD ONE-TENTH MEGOHM RESISTANCE BOX.

listens to the gum chewing at the other end will also miss her.

Everybody will bid her adieu with different emotions. Some will be glad and some will be sorry. Taking it all in all, however, we believe the latter feeling will predominate. She isn't half bad if you only understand her.

Bid her a long farewell and hang up the receiver.—*Chicago Globe.*

Pat Answers the Telephone.

A broker, whose residence is connected with his office by private wire, recently had occasion to communicate with his bookkeeper. Business for the day was over, and it happened that, when the telephone rang, there was no one in the office but an Irishman, who did odd jobs about the place. Pat understood just enough about the telephone to make him convinced that he knew it all, and he was delighted at the first opportunity in his life to put his knowledge to practical use.

"Hello!" said the broker.

"Hello!" answered Pat.

The broker thought he recognized the man's voice, so he inquired:

"Is that you, Pat?"

Instead of replying in the affirmative, Pat smiled and nodded his head. Then, feeling that he had answered his boss's inquiry in the proper way, he took up his broom and went out to sweep off the sidewalk. The boys in the office got hold of the story and soon the street was making merry at the broker's expense. Pat is still quite proud of his achievement. He knows that a nod is as good as a wink, so he can't see why it isn't as good as a "Yes" in a telephone transmitter.

New Standard Measuring Apparatus.

The E. S. Greeley & Company, of New York, have recently placed on the market a number of additions to their already large variety of standard testing apparatus. The instruments referred to, which we herewith illustrate, were all designed at the Greeley electrical laboratory by Mr. Charles P. Frey, electrician for the company. The chief aim in constructing these instruments has been to render them as light and portable as possible, without endangering the essential features of accuracy and accessibility. A fine example of success in this line is furnished by reference to Fig. 1, which shows a one-tenth megohm box, consisting of two separately adjusted coils of 50,000 ohms each. The peculiar arrangement of the brass top connections permit the introduction of an infinity plug without crowding. This box weighs but two and one-quarter pounds complete, and being probably the smallest and lightest of its kind manufactured will be preferred when portability is a consideration.

Fig. 2 shows a megohm box having eight readings, which has four readings of respectively 100,000, 200,000, 300,000 and 400,000 ohms.

Fig. 3 illustrates a one and one-tenth megohm box having eight readings, as follows: 10,000, 20,000, 30,000, 40,000, 100,000, 200,000, 300,000 and 400,000 ohms. Taking into consideration the large quantity of wire carried in these boxes they are remarkably light and compact, especially since the wire is (with the exception of the four coils of 10,000, 20,000, 30,000 and 40,000 ohms) all wound on spools of 50,000 ohms each, and separately adjusted, in order to secure the greatest possible accuracy. These boxes are all standard and adjusted at given temperature.

Fig. 4 shows a four-coil Thomson reflecting galvanometer of the Rowland type, placed on the market as a companion to the two coil instrument of this variety, which latter is already well known. The Greeley Company have recently been engaged in conducting a series of elaborate and expensive experiments at their laboratory in order to determine what materials can be used to the best advantage in constructing commercial condensers for telegraphic and other purposes, with the object in view of eventually adding instruments of this type to their regular line of standard condensers. One of the necessary preliminary steps was to provide an improved ballistic galvanometer and some highly insulated plug switches. Models of these were designed by Mr. Frey and shown to interested parties at the Montreal exhibit. In response to a general request the Greeley Company have decided to regularly manufacture these instruments in the future and add them to their list.

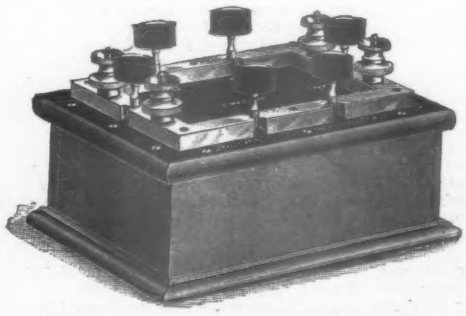


FIG. 2.—STANDARD MEGOHM RESISTANCE BOX.

FIG. 3.—STANDARD ONE AND ONE-TENTH MEGOHM RESISTANCE BOX.

Fig. 5 shows a cut of the ballistic galvanometer which, although built to a certain extent on conventional lines, embodies several novel features. The casing for the mirror is provided with a hood which can be turned so that the reflection from the mirror may be observed from either side. The coils, two in number, are usually connected together in multiple, but may be used independently by removing both of the coupling strips between the binding post blocks. The coils may also be connected together in series by removing but one coupling strip and giving the front coil a half turn. This galvanometer is equipped with a bell-shaped magnet as designed by Siemens & Halske, is highly insulated and is of superior construction and finish.

Figs. 6 and 7 show plug switches mounted on insulated pillars. The plugs are provided with caps which prevent the pillar from spreading when the plugs are inserted and secure firm contact.

These instruments are on exhibition at the salesrooms of The E. S. Greeley & Company, Nos. 5 and 7 Dey street, New York city.

Said She Liked It.

Not many telephone stories will bear telling at this late date, but occasionally one comes to the surface which doesn't deserve

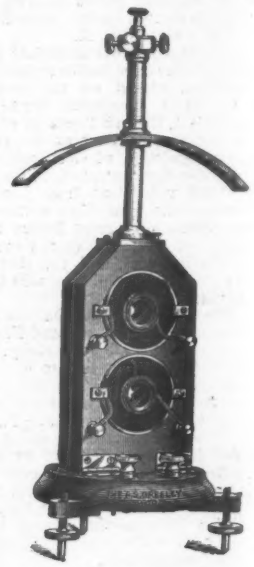


FIG. 4.—FOUR-COIL PATTERN ROWLAND OR J. H. V. GALVANOMETER.

to remain below it. One of the young ladies at the Central office has a singularly pleasing voice, and it is just possible that her features match it. It is just as well, right here, to give the reader to understand that no names are to be mentioned—they are suppressed in the interest of a gentleman who holds public office and who was talked of for mayor. His clerk, who usually did the telephoning, never spoke to the Central office girl without a term of endearment. The discussion over the wires generally began with: "Is that you, dear?" and wound up with "Good-bye, darling!" In the absence of the clerk, the distinguished public man went to the telephone in person. Central promptly answered, and failing to recognize the voice asked, "Is that you, dear?" "No, darling," responded the distinguished public man, "it's the other fellow." It is the good fortune of some wives to make their appearance just in the nick of the most exasperating time. This is what happened in this instance. Behind the distinguished public man, when he said "No, darling, it's the other fellow," stood his wife, who had concluded to visit her husband that morning. She startled him by exclaiming, "Well, I like that!" Did she?—*Brooklyn Life.*

Electric Lighting Effects at the Madison Square Garden.

While standing in Madison Square admiring the beautiful appearance of the Madison Square Garden, dotted with electric lights, a gentleman approached a representative of the ELECTRICAL REVIEW and said: "Well, sir, that sight ought to make a man proud that he is an American." It certainly does make a New Yorker proud to think that such a beautiful and imposing structure as Stanford White has prepared to display the equally artistic lighting effects and possibilities of the Edison incandescent light, is located in such a commanding position in the great metropolis of the new world.

FIG. 5.—BALLISTIC GALVANOMETER.

The electric lighting installation at the Madison Square Garden was fully described and illustrated in the REVIEW for June 21, 1890, page 1. Although the capacity of the plant is 3,600 lights, there are now in use over 5,000. Current for these extra lights is obtained from the Edison mains in the street. In addition to the incandescent lights there are about 25 Ward arc lamps used. Although the exterior of the lofty tower is completed, the interior, which will be used for bachelor apartments, is not yet finished. When this work has been done, the tower will need about 1,200 lights.

On the Madison avenue side of the Garden, and extending half way east on each of the side streets, is an arcade-like porch covering the sidewalk, and supported by many columns. The roof of this porch is dotted with incandescent lights, and suspended from it are a large number of Japanese lanterns, each equipped with an incandescent lamp. In the arches and naves of the porch are placed incandescent lights in pleasing patterns. On the roof each turret is surmounted by a finial composed of 20 incandescent lamps arranged in a bunch.

The top of the tower, which is 341 feet high, and the highest building in the United States, excepting the Washington monument, is surmounted by a colossal bronze figure of Diana, modeled by St. Gaudens. Her feet rest upon a crescent-shaped moon filled with electric lights and around her feet is a circle of light. Below the iron dome which supports the figure is a circular railway, upon which runs a car operated by a velocipede movement and carrying a powerful search-light. The view from the tower, especially at night when the powerful beams of the search-light are projected upon prominent buildings from Harlem to the Battery, is most imposing. No such view of the city of New York can be obtained as from here. The many arc lamps illuminating the avenues dissolve into lines of light as the gaze travels up and down their long expanse.

Other integral parts of the Madison Square Garden are the beautiful assembly room, finished in white and gold and lighted with incandescent lights in a most artistic manner, and the handsome Garden Theatre. The theatre is provided with an electrical equipment second to none, the perfect regulation of the lights being an especial feature. The fixtures, too, are very handsome and unique.

During the last week the large amphitheatre of the Garden has been used for the Chrysanthemum Show, which is held every year in New York. The chrysanthemum being the national flower of Japan, the temporary lighting effects took on a Japanese character. The hundreds of lights which stud the long steel trusses forming the roof were not used; instead, there were festooned from all parts of the immense structure thousands of Japanese lanterns in puzzling figures. Each lantern contained an incandescent lamp. Scattered here and there were large lanterns covering Ward arc lamps. The immense chandelier in the middle of the amphitheatre was covered with pink gauze, and from its edges depended grotesque Japanese curtains, giving it the appearance of an immense lantern. It is said that so many Japanese lanterns were never used before in one place, outside of Japan. The effect produced was most delightful. Aside from its artistic completeness, the light is shed in a mellow glow with scarcely any shadows apparent. The flowers were shown to their best advantage in this light, every shade and tone of color being distinct.

For the idea and arrangement of these beautiful lighting effects the New York public is indebted, in a large measure, to Mr. D. C. Gilbert, the chief electrician of the Madison Square Garden. Mr. W. B. Hadley, of the wiring department of the Edison Illuminating Company, of New York, is also entitled to credit for work done in connection with Mr. Gilbert. Those who missed seeing this treat have reason to regret the fact. Is there anything more entrancing than an artistic combination of beautiful flowers, mellow light and sweet music?

Universal Arc Lamp Company.

This company informs its patrons and the public that it has appointed the Interior Conduit and Insulation Company, of New York, exclusive agents from November 1, 1891, for the manufacture and sale of its apparatus, including: Universal constant potential lamp for incandescent circuits; Universal short decorative lamp for incandescent circuits; Universal railway circuit lamp for incandescent circuits; Universal series high potential lamp; Universal theatrical and focusing lamp.

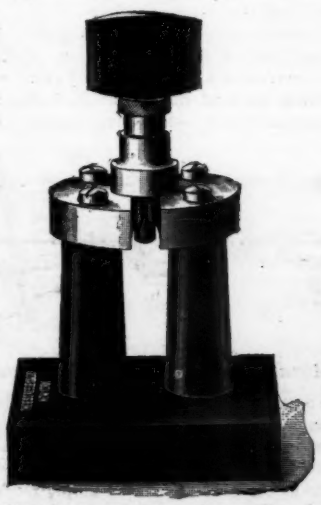


FIG. 6.—SINGLE PLUG KEY ON PILLARS.

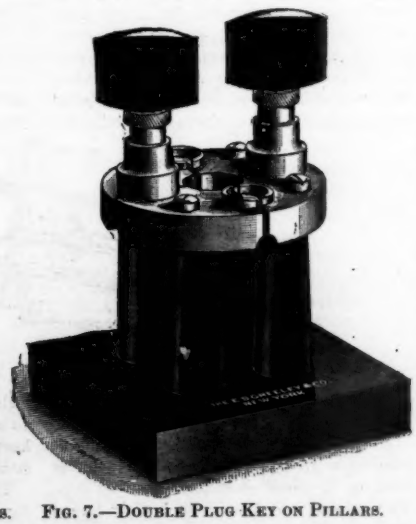


FIG. 7.—DOUBLE PLUG KEY ON PILLARS.

President E. H. Johnson, of the Interior Conduit and Insulation Company, in a circular letter says:

"We have devoted a large portion of our extensive factory to this purpose, and will use our best endeavors to promptly fill all existing and future orders.

"Our aim is to furnish the best and cheapest arc lamp for incandescent and railway circuits that a liberal expenditure of money and ingenuity can produce."

PERSONAL.

Hon. R. T. McDonald, of Ft. Wayne, Ind., visited New York last week, stopping at the Hoffman House.

President Charles R. Huntley, of the National Electric Light Association, spent a few days last week at the Electric Club.

Col. C. F. Sise, of Montreal, president of the Canadian Bell Telephone Company, was a guest of the Hotel Brunswick last week.

Mr. Chas. Brown, of Montreal, superintendent of the Canadian Bell Telephone Company, stopped at the Normandie recently for a few days.

Mr. W. J. Morrison, New York State agent for the Ft. Wayne Electric Company, visited New York last week, making his headquarters at the Electric Club.

Mr. G. A. Kunkel, of the Pennsylvania Railroad Company, a gentleman who has many friends in the electrical fraternity, was the guest of Mr. C. O. Baker, Jr., at the Electric Club recently.

Mr. M. J. Sullivan, who for some time past has had charge of the advertising department of the Edison General Electric Company, has tendered his resignation to take effect immediately. Mr. Sullivan made many friends in his recent position who will wish him success in whatever he may undertake.

Mr. H. D. Stanley, of the Bridgeport Brass Company, was a participant in a railroad accident, recently, that occurred between Chicago and St. Paul. The Bridgeport traveller was not hurt, escaping with the good fortune that is always his, and was able to give prompt and valuable assistance to others who were not so fortunate in escaping without injury.

The Council and the Telephone.

Here is a report of part of the proceedings of a recent meeting of the Los Angeles, Cal., city council:

"Councilman Rees moved that the city agree to maintain a telephone in the office of the Hotel Cummings in consideration of the police officers being given access to said telephone at all hours of the day and night.

"Councilman Nickell said that he did not think that any member of the council would bring such a proposition before that body as that of asking the city to maintain a telephone in a private hotel. Councilman McGarry facetiously remarked that it would not surprise him if the member from Boyle Heights should ask to have the City Hall removed to that enterprising part of the city.

"After some debate upon the matter Councilman Alford moved to refer it to the board of police commissioners, but the motion was voted down by eight to one and the original motion met with a like fate.

"Mr. Cummings, who was present, then signified his willingness to bear half the expense of the telephone if the city would pay the other half, but the council ignored the matter completely."

It is rumored that Bangor, East Bangor and Pen Argyl, Pa., will have electric cars and a central electric light station.

The Brush Electric Light Company, at Niagara Falls, N. Y., has put in a new Brush dynamo with a capacity of 600 lights.

TELEGRAPHIC

.... The telegraph companies have resumed business on the Chicago Board of Trade.

.... The Western Union Telegraph Company is putting in electric clocks at Columbus, Ind.

.... Last week the private wires were removed from the floor of the St. Louis Merchant's Exchange, and were replaced by public wires.

.... Julius L. Rappapot, of Peoria, Ill., has secured a judgment for $50 against the Western Union Telegraph Company for failure to deliver a message. It was shown that the messenger boy had visited Rappapot's place, and, finding him not in, had left a notice. The court held that proper effort and diligence was necessary in order to release the telegraph company from liability, and that the messenger boy should have been despatched the second time.

.... Associate-Justice Brewer, of the Supreme Court of the United States, sitting as a circuit justice on November 2, began the hearing of arguments in the case against the Union Pacific and the Western Union Telegraph Company. The suit was brought by the Attorney-General under the Anderson act, which compels all subsidized railroad companies, which are required to construct telegraph lines, to furnish to connecting lines equal facilities for the transmission of business. The government seeks to abolish the contract between the Union Pacific and the Western Union, because the contract grants to the telegraph company exclusive rights to the occupancy of the railroad company's depots for commercial or public telegraph purposes, as against any other telegraph company. This destroys competition.

.... A new telegraph instrument has been invented by Herr Jaite, director of telegraphs in Berlin. The apparatus contains two electro-magnets, the one worked by a positive and the other by a negative current. These set in motion a perforator, whereby holes are punched in a tape. The holes, instead of consisting of mere dots and dashes, as in the Morse system, are so arranged that on joining them with lines the letters of the Roman alphabet are formed. The chief merit of the machine is said to lie in the extraordinary ease with which it can be worked. It is stated that at a recent trial between the Berlin and Hamburg stock exchanges, a distance of nearly 200 miles, it was found possible to send from 65 to 85 messages per hour, or from 25 to 35 words per minute. It is claimed that the public will easily learn how to decipher the perforated tape, and will, in time, be able even to perforate their own messages and hand them to the telegraph officials for immediate transmission. Before, however, being convinced of this desirable possibility, it will be necessary for the public to know more of the details of the system.

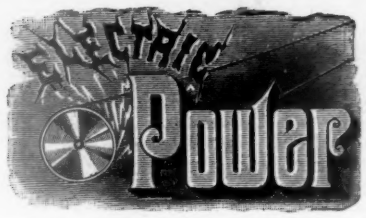
LITERARY.

We have received "Reports from the Consuls of the United States," for August, 1891.

We note many improvements in recent issues of *The Business World*, published at Detroit. This journal covers the interests of practical education, the office and business.

The census department has sent us bulletin No. 115, giving statistics of the steam railways of New York, New Jersey, Pennsylvania, Delaware, Maryland and part of West Virginia.

Gas and electricity are bidding against each other for the job of illuminating Mt. Sterling, and the election to decide between them has been postponed awaiting new and better propositions.



* * Hamburg, Pa., will build an electric street railway.

* * The Cedar Rapids, Ia., Electric Street Railway will be in operation this week.

* * Electricity is soon to take the place of mules as the motive power for Hot Springs, Ark., street cars.

* * The latest craze in Michigan cities of from 8,000 to 20,000 population is an electric street railway.

* * The route of an electric road has been surveyed between Grand Rapids, Mich., and its chief suburb, Grandville.

* * The Pacific Improvement Company has begun work on an electric road on Telegraph avenue, Oakland, Cal.

* * Robert Loudon's machine shops at Bloomington, Ill., were operated by electric motors for the first time last week.

* * The chimney at the new power house of the Lowell, Mass., and Suburban Railway Company will be 180 feet in height.

* * Last week work was begun on the new car house of the West Side Electric Road, at Wilkesbarre, Pa. The car house will be of brick, 55x200 feet. A boiler house will also be built 55x100 feet in size.

* * The announcement that the Villard syndicate had bought the Becker line of street railway at Milwaukee was made public last week. By the purchase the Villard syndicate comes into practical possession of all the street railway facilities of Milwaukee, comprising about 120 miles of track.

* * The selectmen of Beverly, Mass., at a meeting last week took under consideration the petition of the Naumkeag Street Railway Company for permission to introduce the trolley system of electric propulsion for street cars in the town. A verdict adverse to the petition was reported.

* * The entire system of San Diego, Cal., street car lines, embracing several miles of track operated by horses, was purchased recently by A. B. Spreckels, son of Claus Spreckels, the sugar king. He will at once convert the main portion of the system into an electric road and eventually will adopt electricity on all the lines.

* * The annual meeting of the West End Street Railway Company, of Boston, is called for November 12. Books close November 2 to November 12, inclusive. Successors will be chosen to Directors Potter and French. President Whitney is now preparing his annual report. It will probably show above $100,000 surplus, although $200,000 more in dividends has been paid.

* * The earnings of the St. Paul Street Railway Company, covering about 90 miles, all operated by electric power, except a few miles of cable, show as follows:

	1891.	1890.	Increase.
July.....	$76,664	$61,422	$15,242
August	73,215	53,601	19,614
September...	81,538	58,470	23,068

Increase for nine months since January 1, $147,682.

* * In a short time four new electric lines will be started at Minneapolis. They are the Plymouth avenue, north, the Monroe street, northeast, the Cedar avenue and the Bryant avenue lines. Work on the first three of these lines is rapidly approaching completion and good service will be guaranteed. The down-town terminus of the new Plymouth, Cedar and Monroe line is not detemined upon. Large "Jones" and "Northern" cars are to be put on the new lines. Work on the Bryant avenue extension of the Lyndale line will be prosecuted now with vigor till completed.

Pennsylvania Railroad Ferry Boat "Cincinnati."

This new and palatial addition to the company's fleet received a royal send-off on Friday, November 6, when, on the invitation of General Passenger Agent Wood, a large number of representatives of the press and members of the railroad fraternity gathered on board, and enjoyed a most delightful run up the Hudson.

This boat, which is the first of the new type soon to be used altogether on the Pennsylvania lines, is, without doubt, the finest steamer ever used in the ferry service in this country, and is destined to revolutionize the methods of ferry transportation.

She is a double-decked screw propeller, 206 feet long, with a beam of 65 feet over guards. Her hull is of iron and divided into 14 air-tight compartments. She is fitted with fore and aft propellers, 8 feet 9 inches in diameter, with a 13 foot 6 inch pitch. Her engines have developed 1,020 horsepower and she has made 15 miles an hour at 93 revolutions to the minute. She can make her regular run from dock to dock in four minutes.

The exterior is painted in the dark red and black of the rest of the fleet, but relieved at either end by handsome gold decorations, and three large bay windows of beveled glass on either side. The walls and ceilings of the interior are beautifully decorated in panels of pearl gray and silver, and combined with the handsome carved wood-work of root mahogany, warm-colored Brussels carpet and plate glass mirrors, sparkling under the brilliance of over 200 incandescent electric lights which adorn the walls and ceilings of the saloons, the effect is very rich and artistic.

As far as the safety and comfort of the passengers are concerned, no possible device tending to these ends has been omitted. The saloons are heated by hot air forced through pipes from the engine room and entering through registers near the ceiling, thus effectually doing away with the old roasting process of steam pipes under the seats. The temperature is regulated automatically by means of a thermostat, and fresh air is constantly being forced in through ventilators near the floor.

The boat is lighted from keel to upper deck by electricity, not an oil lamp being in use in any part. The signal lights are also electric, and the plant consists of two United States dynamos, one having a capacity of 250 lights and the other 37. The larger dynamo, which is used at night, is driven by a 23 horse-power engine, and the small one, which is mainly used for lighting the engine room and signal lights, by an eight horse-power Beck engine.

The boat is fitted with the latest appliances in steam steering gear, and in her run up the river fully demonstrated her steadiness, and the ease with which she could be handled.

A fine collation was served to the guests in the lower cabin, and the representatives of the company and officers of the boat spared no efforts to make the trip a most enjoyable one. The boat is certainly a masterpiece of her class, and the company may be proud of a fleet of which she is the forerunner.

Tropical American Telephone Company.

The illustrations presented herewith show two of the telephone sets manufactured for the export trade by the Tropical American Telephone Company (Limited), of Boston.

FIG. 1.—TROPICAL AMERICAN TELEPHONE COMPANY'S BELL AND BLAKE COMPLETE TELEPHONE SET.

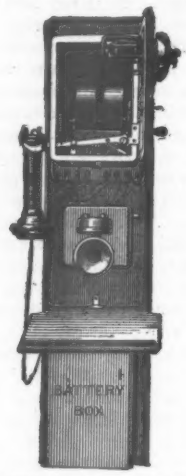


FIG. 2.—TROPICAL AMERICAN TELEPHONE COMPANY'S UNIVERSAL LONG DISTANCE TELEPHONE SET.

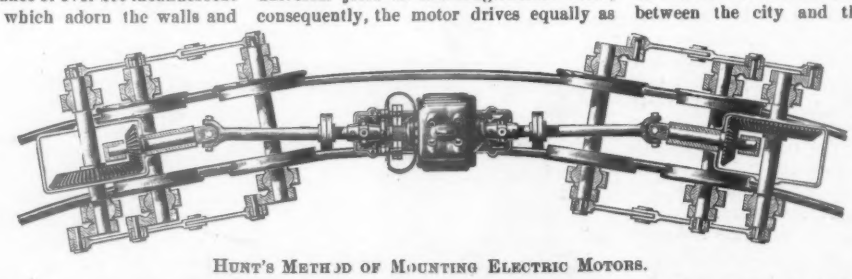
Fig. 1 is an illustration of a Bell and Blake set for ordinary lines; a universal long distance set is illustrated in Fig. 2. This set, equipped with a Berliner transmitter and two dry batteries, will talk over long lines where the Blake instrument fails.

Hunt's Novel Method of Mounting Electric Motors.

In our last issue we illustrated two types of the Hunt electric locomotive and we herewith show the gearing arrangement of an eight wheel coupled locomotive.

The complete flexibility of this system of driving is one of the main features. Each truck swivels on a king-pin directly over the universal joint of the longitudinal shaft; consequently, the motor drives equally as well on a curve as on a tangent. There is an elastic coupling arranged on the shaft to keep the pressure on the gear teeth as constant as possible.

The locomotive, while it has ample room for the mechanism, will pass around the shortest radii of curvature usually used in mining. These locomotives using this method of mounting are manufactured by the C. W. Hunt Company, 45 Broadway, New York.



HUNT'S METHOD OF MOUNTING ELECTRIC MOTORS.

The electric wiremen's and linemen's unions of America will meet in convention in St. Louis, November 21, to organize an international union.

Fire was discovered October 23 in the Gibson Electric Company's plant, a short distance from Chatham, N. Y., and in a few hours the plant was totally destroyed. Oily waste is supposed to have caused the fire. Loss about $35,000; insurance, $14,000.

Electric vs. Steam Cranes.

These figures on the cost of operating a crane plant on a London wharf have been made public: Formerly there were on the wharf a 10 ton steam crane, a two ton steam crane and two 30 cwt. hand cranes. The cost of coal for driving the two steam cranes only was $1,350 per year, steam having to be kept up night and day. All four of these cranes were fitted with electric gear, and a dynamo with all necessary wiring, switches and safety fittings was put in, the total cost being $1,500. A gas engine used for chaff cutting drives the dynamo and the cost of the gas for the whole of the work—cranes, chaff cutter and corn crusher, besides an ordinary friction hoist—is given as $280 for the year, while the amount of the work done has been considerably in excess of any previous year. The engine is a 12 horse-power Otto gas engine. The cost of repairs and renewals for the year has been a little more than $25.

Electric Cars Burned at Newark.

The Rapid Transit Company, of Newark, sustained a severe loss the other morning by a fire which totally destroyed ten of their fine Pullman cars and the car house in which they stood.

The flames were discovered by the watchman before they had gained much headway and had there been any water at hand the fire could have been easily extinguished, but by the time the alarm had been given and the engines arrived the fire was beyond control.

The burned cars were built by the Pullman company, and were probably the finest electric street cars in the country. They were finished in olive green with mahogany trimmings, white mohair covered spring seats and gun metal rails and rods. They were also vestibuled and had two motors each.

The company own 35 of these cars, costing about $4,000 each. Two sweepers and a snow-plow were also destroyed, and the total loss is estimated to be between $50,000 and $60,000, fully covered by insurance.

A Westinghouse Contract Quickly Obtained.

A recent issue of the daily *Beacon*, Ashtabula, O., contains the following: "The special session of the council called last evening to settle the electric light contract was one of the shortest on record, as it was only 22 minutes from the time Mayor Moore called to order until an adjournment was made. All members were present, and as the consideration of the contract between the city and the Westinghouse Electric and Manufacturing Company was the only business that could be legally transacted at the meeting, it was at once taken up. The contract provides for the furnishing and erecting of the wires, poles, 51 arc lamps, two 60 light arc dynamos and one 500 light incandescent dynamo. Nine bids were submitted by as many companies for the contract, but only five were considered: Thomson-Houston, Western, Fort Wayne, Edison and Westinghouse. After a careful investigation and examination of all these systems, the committee reported in favor of the Westinghouse company's bid. The system is an alternating one, and the lamp, instead of throwing a light down at an angle of 45 degrees, gives a light that penetrates far into the darkness.

Councilman Raser offered a resolution that the mayor and clerk be authorized to sign the contract on behalf of the city. After a little discussion the resolution was unanimously carried."

Exhibit of "Helios" Actien Gesellschaft of Köhn Ehrenfeld, at the Frankfort Electrical Exposition.

The Prüfungs Commission have just completed the test of the large alternating current steam dynamo, and although the data has not as yet been officially made public the following will be close to the exact test. The output of the dynamo at full load was from 390,000 watts to 420,000 watts. The indicated horse-power was about 660 horse-power, and the power absorbed by the engine alone was nearly 100 horse-power. The conditions of working were very poor during the test for the engine as the foundations were bad and the large cylinders vibrated badly. The total efficiency from indicated horse-power to the power obtained at terminals of the machine will reach 80 per cent. In the station at Rome, where the engine was working under better conditions, an efficiency of 82 per cent. was obtained from engine to terminals of machine. The efficiency of the dynamo at that test was 92½ per cent., including the magnetizing current, and everything points to an equally high efficiency at this test. The transformers have an efficiency of 96½ per cent. at full load, with 1¾ per cent. loss in the coils. In the 10,000 watt transformer, 190 watts are necessary for magnetizing the transformer. The meter was tested during the exhibition and it was found to require eight watts to operate it, and it measures current from one-half lamp, that is, two lamps in series to 200 lamps, *i. e.*, a current of 100 amperes. The arc lamps are yet to be tested for required number of volts necessary for best working of the lamps. There are in use on circuits four lamps in series with 105 to 110 volts potential, *i. e.*, about 26¼ volts each. These arc lamps, although using alternating current, do not hiss or make a particle of noise; this certainly overthrows the theory that the reason the alternating arc lamps in America hiss is from the nature of the current and not on account of the lamp mechanism or kind of carbons used.

In Wien this company has 60 kilometres of underground concentric cable in use, and the total resistance of insulation, including all transformers, for 22,000 lamps, is two megohms. These are certainly wonderful figures for underground cables. P.

Frankfort, Oct. 17.

Alternating Current Machines at the Frankfort Exposition.

At the recent electric exposition in Frankfort-on-the-Main the central dome of the machinery hall was entirely occupied with the exhibit of the Köhn Ehrenfeld Association, which has adopted the name of the Helios Company, a very appropriate one for an electric light association, as this word is the Greek for sun and sunlight. We have received a photograph of the appearance of this magnificent exhibit as a whole, but, as by the confusing multitude of electric contrivances there is no chance to make any useful explanation, we will not reproduce it, but prefer to give the reproduction of some of the most important single machines.

It should be remarked that the Helios Company were, in this exhibition, the only representatives of the alternating current system, for the simple reason that they control, in the German empire, the most important patents in this line—those of Ganz. Their exhibits showed different methods of illumination and of transmission of power by means of alternate currents.

What an immensely progressive step has been made in the last few years! When the Franklin Institute, in Philadelphia, gave their very meritorious electrical exhibition, there were a great many dynamos of various makers and great variety of style, of principle and of model, but not a single alternating one, and serious complaints were made by inventors who were ahead of the times, and who came there with the principal purpose to test some of their new inventions requiring powerful alternating currents, but were greatly disappointed and surprised that none of the great bulk of electricians and exhibitors had yet progressed far enough to see the great future in store for the alternating current system, and that not even any attempt had been made in this direction.

The Helios Company had placed on the foreground of their section a colossal machine of this kind, which was very peculiar in its construction, and which we have represented in the illustration on this page.

It has a colossal cast-iron framework for base, which serves for the support and combination of two steam engines and two dynamos. The cylinder of the largest of these, seen at the extreme left, is a compound engine of 600 horse-power, and drives the fly-wheel, which has been converted into a rotating magnetic field by surrounding its outer end with 48 electro-magnets, of which the coils are wound in such a way as to give them alternately north and south polarities at three outside extremities; around them are placed, inside a larger stationary heavy iron rim, 48 similar electro-magnets, slightly larger, which are the stationary armatures in which, by the revolution of the exterior ring, alternate polarities are generated and the consequent alternate currents in their coils.

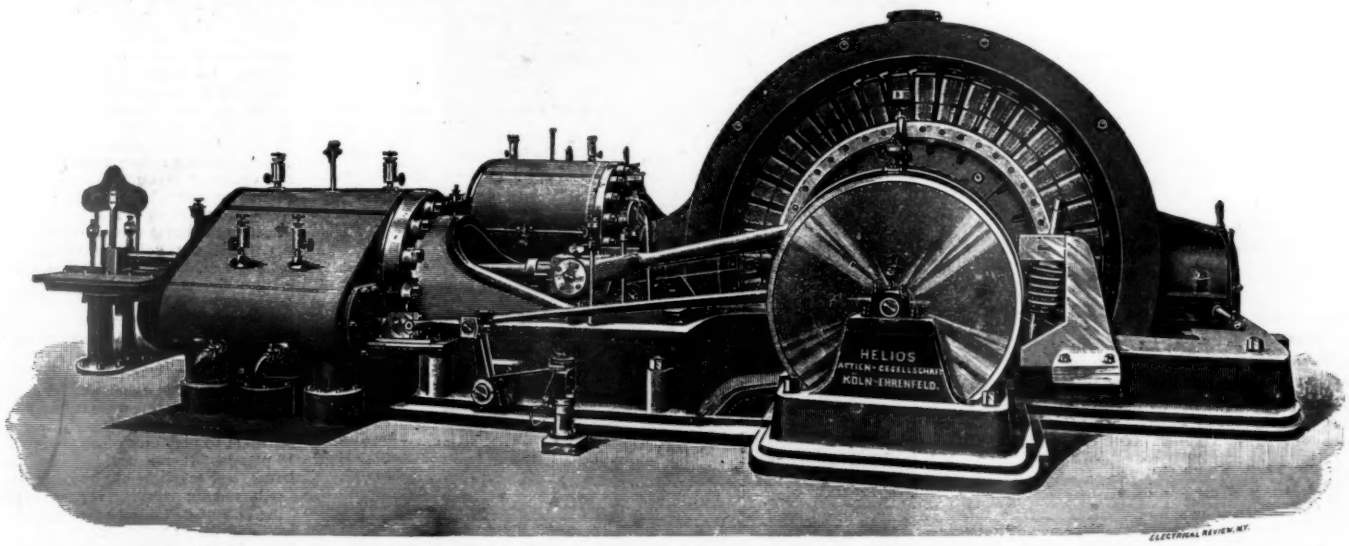
There is a great advantage in such a construction, as currents can be taken from any arbitrary number of stationary electro-magnets, and they may be combined in different ways for high voltage or by parallel connections for great quantity of current (a high number of amperes).

These machines are also constructed with the purpose to avoid the use of converters, but combine the coils of any required number of the stationary armature magnets in such a way as to attain the voltage and amperes required for different lines.

The revolving fly-wheel armature is permanently charged by another direct current dynamo, with Siemens' winding, not seen in the figure as it is situated behind the great armature, but the cylinder of the engine driving it is seen between the main cylinder at the left and the fly-wheel. This smaller dynamo communicates its current of 100 volts to the revolving field by means of two insulated rings placed on the axis, each of which is connected with one of the two ends of the coil which is wound around the 48 electro-magnets, while this is revolved by the large steam engine at the extreme left with 600 horse-power, and by its revolution of 125 per minute gives 48x125 or 6,000 alternations per minute, each of 200 amperes and 2,000 volts.

Electric Lighting in Berlin.

A report recently issued by the Berlin Electricity Works gives some interesting figures on electric lighting in that city. During the past business year up to July 1 the number of consumers increased from 872 to 1,314, or about 50 per cent., whilst the corresponding number of lamps, reckoned by the current used, increased from 74,959 to 104,100. The increase in the number of lamps is not proportional to the increase in the number of subscribers, as electric lighting is being more extensively adopted by private individuals, whose demands were previously so small as to be considered unremunerative by electric lighting companies. It seems probable that during the forthcoming Winter a further quantity of 25,000 to 30,000 normal lamps will be utilized. The electrical transmission of power for industrial purposes has also made considerable progress. The Berlin Electricity Works has recently made its charges more uniform and cheaper in order to afford greater facilities for its use to small industrial works. The motors supplied with current by this company during the past year made use of 274,457 kilowatt hours against 69,591 kilowatt hours in the previous year. The total amount of energy used for electric lighting purposes increased from 42 to 64.6 million of normal lamp hours, an increase of 41.5 per cent. The production of this current absorbed 10.53 million of horse-power hours.



"Helios" Alternating Current Direct-Coupled Dynamo at the Frankfort Electrical Exhibition.

Society of Mechanical Engineers.

The twelfth annual meeting of the American Society of Mechanical Engineers will be held at the house of the society, 12 West Thirty-first street, New York, commencing Monday evening, November 16.

ELECTRIC LIGHT NEWS

—— The electric light company at Salina, Kans., will improve its plant.

—— A local syndicate has contracted to provide Knightstown, Ind., with electric light.

—— The Edison Electric Illuminating Company, of Rochester, N. Y., is adding a new station to its system, making three in all.

—— J. Knapp Fort has been appointed superintendent of the electric light plant at West Troy, N. Y., vice W. B. Waldron, resigned.

—— Henry Whittaker, electrician of the People's Edison Electric Illuminating Company, has been appointed superintendent of the plant at River Point, R. I., and will combine the duties of the two positions.

—— Button-hole electric lamps, it is said, are being tried as a part of the outfit of conductors on London omnibuses, the current being furnished by a pocket battery. The circuit is closed and light produced only when necessary to examine tickets.

—— The Santa Fé, N. M., Electric Light Company and Gas Company are figuring on a combine.

—— The city council of Carrollton, Ga., has bought the electric light plant of Mr. Henry Lanier for $6,400.

—— At the recent annual meeting of the stockholders of the Newburgh, N. Y., Edison Electric Illuminating Company, the following board of directors was elected: H. B. Beckman, president; James T. Lawson, vice-president; Samuel C. Mills, M. C. Belknap, E. K. Shaw, Charles J. Lawson, Lewis M. Smith.

—— J. A. Bendure has given up his lease on the Pittsburg, Kans., electric light plant and gas works, which are now under the management of Oliver T. Boaz, president of the company. Mr. Bendure has been retained as superintendent of the plants.

—— The National Electric Manufacturing and Construction Company, of New York, has secured a franchise from the highway commissioners of the town of Oyster Bay, Long Island, to construct and operate an electric plant to be located at Oyster Bay, to supply the different villages on the north side of the town.

—— Richard Heckscher, a stockholder of the Edison Electric Light Company, at St. Paul, Minn., has been successful in his application to the court to compel the company to produce its books and accounts for his inspection. He brought action against George H. Finn, the company's secretary and treasurer, for this purpose, and Judge Cornish held last week that he was entitled to examine the records as a stockholder.

—— The city council of Albany, Mo., has let the contract for the construction of an electric light plant to the Westinghouse Electric and Manufacturing Company, of Pittsburgh, Pa. The price is $7,150. The plant will consist of an engine and two dynamos, with capacity for 30 arc lights and 500 incandescent lights. At the beginning 14 arc and 300 incandescent lights will be put in operation. The wires will make a complete circuit of about three and one-quarter miles in length, making six and one-half miles of wire. The work is to be begun as soon as possible, and Mayor Kingsborough thinks the lights may be in operation within six weeks.

Musical Telegraphy.

BY G. P. HACHENBERG, M.D., AUSTIN, TEX.

It is a matter of interest to go through an analytical investigation of the first ideas, emotions and circumstances that led the inventor to an important invention. His mental application on the subject of his invention from beginning to end is a process of evolution. His first plan may be crude and even confused, but still it may retain something, the nucleus, that may prove mighty and wonderful in results. No one can fathom this metaphysical question better than the successful inventor himself. But in connection with this question, how many take in the dawn of great ideas that point to great inventions, that cease their prosecution in one of the stages of their progress—sometimes even at the very point of consummation, and, therefore, may run amiss of great renown and even wealth.

I would hardly be warranted to open my subject in this style if certain leading electricians of this country had not given me their favorable recognition of my musical telegraphy in a manner that led me to flatter myself that I am the pioneer of an invention that in the near future will assert its importance as one of the great inventions of the age.

For years in the progress of my study on the subject, I held in high consideration its importance, and became more fully confirmed in this view after taking counsel with wiser and more experienced men than I claim to be myself. Prior to 1860 I presented the subject to the late Professor Henry, and it will ever be with grateful feelings I will think of that great man for the encouragement he gave me in this invention. So sincerely was he interested in it that he offered me the use of the upper floor of the Smithsonian Institute for experimental purposes, and I am fully convinced, if circumstances had been such that I could have accepted his offer, he would have co-operated with me to bring the invention to a practical issue.

Of late years my correspondence with Bell, Edison, Blake and other noted electricians, gave me a further guarantee as to its practicability. Although receiving this encouragement in casual ways, I have my doubts if the full scope of musical telegraphy was taken in by any of these eminent electricians.

The main features of my system of musical telegraphy are as follows:

1. The electrical connection of 10 pianos for concert purposes, to be operated upon by one player, either individually or collectively. This plan we recommend for immediate adoption, and in coming up to our expectations all other plans would be of easy execution.

2. The electrical connection of 10 organs for church music, operated in like manner.

3. The reproduction of electro-music at a distance.

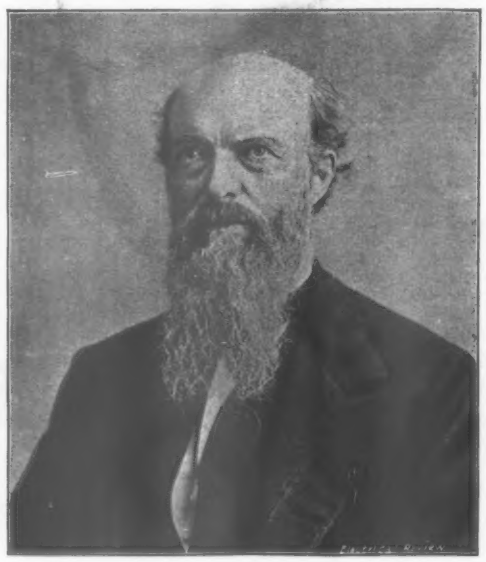
4. The electro-musical hall for operatic music, etc., where a great number of musical instruments may be electrically connected, or rather incorporated with the entire inside lining of the building.

5. Electro-automatic music, by transferring the music from an ordinary music box (properly prepared) to the 10 pianos. The expression of this class of music is governed by a key-board to be described hereafter.

There are other combinations that could be effected, but the limits of this paper will not allow me to take them into consideration now—as of bells, glass and other metallic contrivances. An electro-bell music could be made very attractive.

1. To connect electrically 10 pianos, and to operate on them with the best effect, the combination has two key-boards. One that is adjusted to the instrument occupied by the pianist, and has as many keys as there are keys in the piano. By means of this key-board electrical connection is secured with any number of pianos in the circuit. Not to impose new duties on the pianist in playing on these instruments, there is another key-board of 10 keys that is under the supervision of a musical director, who makes and breaks the electrical connection between the 10 pianos for the purpose of regulating the volume and expression of the music. The 10 pianos can be played upon simultaneously, or the most rapid run of notes can be secured without taking two successive notes out of the same instrument. By placing these 10 pianos in a certain position, the notes reaching the tympanum from different points gives the music a timbre that is both grand and peculiar.

But why limit the number to 10 pianos, or 10 organs, and the small key-board to 10 keys? They are to correspond to the 10 digitals of the musical director. The pianist's manipulations in playing may be exceedingly rapid; such effort is not imposed on the musical director. His 10 fingers cover the 10 keys of his key-board, and by the slightest pressure of one or more of them the necessary connection is made. A more perfect arrangement between the co-operation of the two musicians, I believe, cannot be devised. It will be readily seen that the musical director is the head figure of this order of music, for it is he that (aside of all pedal action) gives it expression relatively with the skill he is able to command. When I explained this feature to Rubenstein, the great pianist, he demurred to the arrangement and asked: "Where is the individuality of such music?" I tried to make him understand that it must be sacrificed, if the music itself can be advanced.



DR. G. P. HACHENBERG, OF AUSTIN, TEX., INVENTOR OF MUSICAL TELEGRAPHY.

There may be an impression with some that this combination of pianos is characterized by much noise, like that of an ordinary brass band. Volume is not so much a desideratum as harmony and delicate expression. The ordinary expressions of a single piano are very limited; through the pedals there are but four, and they are very limited through the touch of the player. But, by a mathematical calculation, these 10 pianos have the range of 400 different degrees of expressions for each note. It is simply wonderful how these can be utilized. It is here the mysterious hand of electricity in a new role shows its power to please, where heretofore we only associated it with force and terror.

It may be rather strange to state that the highest order of music to be effected by these 10 pianos is in accompaniment with the violin, flute or some other musical instrument, or even a brass band, and, in particular, with vocalization. The sympathetic vibration of sounds are well understood by scientists; but where modified by the laws of harmony, under different acoustic effects, as can be enforced by a system of electro-music, the result must be incalculably enhanced.

2. The main object in resorting to organs for church music is to diffuse the music and to destroy the emanation point where but a single instrument is used. The music would be in harmony with the congregational vocalization. A few concealed organs in the loft would greatly increase the effect. All the organs but one should be of a small size.

3. There are two methods in reproducing music at a distance—the telephonic and the instrumental—the latter being produced by the direct dynamic operation of electro-magnetism on the instrument in the distance. The former has been tested by several eminent electricians, but never with satisfactory results. The difficulty is in the loss of timbre of several notes in the scale of music. The telephone for the transmission of the human voice has the same defect, in particular with the pitch of some voices. In my experiments I have greatly remedied this defect by placing a small feather cushion between the receiver and the ear. I was led to think that there was a peculiar relation existing between feathers and electricity, believing that there was an "Electro-operation in the Flight of Birds" (*vide* ELECTRICAL REVIEW, April 28, 1888). The instrumental plan is the only feasible plan to reproduce music in the distance. This may be done by connecting the parent instrument with any number of instruments stationed at different places. One practical utility of such an arrangement, aside of its novelty, is for a distinguished music teacher on the piano to instruct simultaneously many pupils at the same time, living in different parts of a city, or even in different towns; and another, having the pianos connected much after the fashion of the telephones, for the exchange of instrumental music between musical friends. Of course, this would demand a central station, as in the telephone, and an "electrical attachment" to each piano.

4. The most extensive, as well as the most perfect, development of musical telegraphy would be in an "electro-musical hall" containing every variety of musical instruments that could be manipulated by the aid of electricity. The location of these instruments and the acoustic arrangement of the hall would demand the best attention science could bestow. This concord of instruments is not in general, if ever, utilized in unison, but to have on hand to render the greatest variety of music; or, rather, put in action such instruments that are in keeping with the nature of the music to be played. It is here that the musical director, with his small key-board, will prove the wonder of all. Is it possible that a little instrument in the hands of an expert can call forth such a combination of sounds, or almost like a flash cast warbling many thousand notes in the air? Who can tell where these notes come from? The muffled notes from the deep stone vaults underneath, the soft sweet flying notes from above, and a flood of harmonies from all sides, are often blended with extraordinary effects; sometimes falling on the audience much like rumbling thunder and then die away like the sighing zephyr. In this hall there is a stage, such as we see in the theatres; it may be occupied by the managers of the concert or the participants of the opera, a prima donna, or otherwise serve as a relief to the eye. If we are inclined to give the prima donna a pre-eminence with the ten piano arrangement, here she would be placed in an atmosphere of music, where every strain of her own voice would be carried still in deeper melody by this colossal but tender accompaniment. The poet may dream of the heavenly song from the lips of Israfril, but he may soon find her heavenly gifts a terrestrial reality under the mysteries of electricity.

5. Automatic music has never been popular, and almost invariably has been looked upon with horror by the musicians. There are very good reasons for this, from the fact that all appliances producing this kind of music are cheap and miserably constructed. Perhaps the most acceptable of them is the best and most costly kind of the common music box. What merit the best of these instruments have is their action of good time, but their music is deplorably deficient in expression. To make *expression* in keeping with their *time*, so mathematically exact, is a matter that can be readily effected by transposing their music under our 10 piano system. The electrician can readily see how a music box can be so reconstructed that it will transfer its music to the 10 pianos, taking the place of a pianist at the large key-board, leaving the task to the musical director to give it expression that would mask every trace of its machine work.

But there is one feature in this kind of music that is much in its favor. In complex harmony it would supersede that coming from a pianist. For, as the manipulations of the pianist are limited to 10 fingers, such a limitation would not exist by our electro-automatic music. This advantage would have its characteristic effect. It may be hardly necessary to state that the music box itself may be placed out of sight, and beyond the reach of hearing; or it may be of interest to sit close to it and study its tiny accords with the bolder notes from the pianos. Of course, each note from the two would be strictly simultaneously expressed, which, in itself, would be a source of interest. The expression would be nothing like the stiff awkwardness of a duet.

To prepare a music box for this purpose the cylinder is cut into as many rings as there are notes in the scales; each of these rings is insulated. The steel tongues that produce the notes are insulated in like manner. Without going into details it will be readily seen by electricians how the music is reproduced in the pianos from a music box thus modified.

I remember in some of my lectures on musical telegraphy I spoke of a "musicometer" in connection with my invention. This instrument was something like a music box, only it was *dumb*, and the projecting pins in the drum were movable, that is, placed on a slide, and so constructed as to set them to play any piece of music on the 10 pianos. It was nothing else but an electrical test machine of any complex and difficult music; giving very accurately the time in music, but with the expression given by the musical director.

As to the practicability and commercial importance of musical telegraphy there cannot be the least doubt. The only one that should now be constructed is the first in series. The pianos used in that combination require no reconstruction whatever, except the removal of the pedals. The cost of the different attachments and other incidental expenses would be less than $5,000; but let the entire cost be $10,000, it would prove a very profitable investment, where many hundred thousand dollars could be realized from concerts alone. For who would not pay an admission fee to hear this electro-music? As to the electro-musical hall, a considerable capital would be required to make it a success. But such a hall stationed in any of our large cities would prove yearly the Mecca of many hundred thousand.

These are some of the outlines of my musical telegraphy I first fixed upon when residing in Springfield, Ohio, several years before the war. But what were the premises on electricity in those days to turn such a scheme into a practical shape. Then our knowledge of electricity was limited, at least so to the writer, although he had experimentally taken some interest in the subject before.

In 1863, when on a temporary relief from my military service, I wrote out the details of my invention for one of the Cincinnati papers. In the excitement of the war the paper attracted but little attention in this country, but in some foreign land the scheme was accepted with interest, and its practicability acknowledged by some of the scientists. Godey's Ladies' Book, March number, 1864, contains an extract on my musical telegraphy, taken from a London paper, that shows that I then based my invention on the telephonic principle, to use a modern expression. I finally came to the conclusion that the telephonic plan would never be of any great service in music. To maintain the purity of musical notes, the plan was

changed, by acting on musical instruments *direct* through electro-magnetic dynamics. On this plan everything now appeared clear, with not a single barrier in the way, to bring it to a ready and successful issue, without resorting to hardly any experimental work.

To gain the attention of the public, and the electrical fraternity in particular, I made it the subject of a lecture I delivered in different parts of the United States. This lecture was delivered in the Crosby Opera House, in Chicago, April 9, 1869. It was then proposed, on the part of the audience, to make musical telegraphy a Chicago enterprise, with a view of celebrating the completion of the Pacific Railroad, but it could not be furnished to the Chicagoans in season for their jubilee.

In 1871, through the courtesy of the Hon. Mr. Lord, of Rochester, N. Y., application was made to the State legislature for a charter to incorporate the Musical Telegraphy Company. At that time I lived in Rochester and took an active part in musical telegraphy rather preparatory to have it introduced at the Centennial celebration. I then proposed to issue stock, after $20,000 stock were ordered. The list was headed, ordering a liberal amount, by the Hon. Charles W. Briggs, Mayor of the city. As the amount was not guaranteed, the stock was not issued. I had free access to the three principal dailies of the city, who from time to time accepted my papers on the subject. The nature of these papers was usually explanatory of the subject, and, as in this communication, nothing was kept secret. It was rather remarkably co-incident (as I was told afterwards) that Professor Bell lived in Rochester at the same time and was working on his telephone; and I was likewise informed that Dr. Gray heard my Chicago lecture in 1869.

In 1872 the subject was presented to the United States Centennial Commission, which met their favorable consideration, as can be seen in their published proceedings for 1872, Appendix 3, p. 92–3.

February 19, 1873, I treated the subject in its scientific aspect before the Franklin Institute, of Philadelphia.

About this time I went to Texas on account of my health, and had to abandon business entirely. Soon after I came here I received an offer from the Shoemaker Piano Co. that they would defray the expenses of constructing the "Electrical Attachments" if I would apply them to pianos of their make at the Centennial. I could not accept their offer, owing to certain conditions.

In 1890 the manager of the International Electrical Exposition (that was held in St. Louis) asked me to make an exhibition of my invention. He promised material aid to get it ready for the fair. But the time allotted to comply with his request was entirely too short, and I declined to take action in the matter. It will take several months to construct the "Electrical Attachments" on the 10 piano system, and about the same time will be required after they are completed for the musical director to learn to control them with the best effect.

When it was decided to have a World's Fair in Chicago I offered my musical telegraphy to the Commission on the terms I did to the Commission of the Centennial, asking them to defray the cost of making the electrical attachments for the 10 pianos. They received the offer apparently with interest and asked for many details as to the cost, space, etc. I am doubtful that they will meet my demands, perhaps under the impression that outside capital will bring it into the Exposition anyway. If we are forced to this alternative, let any State, city or electrical association accept the offer I made the Commission and place it in its own department at the Fair. At the same time it will have the faithful co-operation of its inventor to make musical telegraphy a prominent attraction of the World's Fair.

Commissioner Hornsby Returns from Europe.

Mr. J. Allan Hornsby, secretary of the department of electricity, World's Columbian Exposition, who was recently sent to Europe as a commissioner in behalf of the department of electricity, has returned. Mr. Hornsby rendered his report on November 3 and requested his discharge as commissioner to Europe. The report is quite lengthy but very interesting. The following presents the chief points in his report:

Under the letter of instructions issued to me September 10, 1891, I was commanded to "at once proceed to Europe under the immediate orders of the chief of the electrical department, and visit the Electrical Exposition at Frankfort-on-the-Main." When said Exposition was closed, I was "to visit such other points in Europe as was deemed advisable by the chief of the department." I was instructed to secure photographs and drawings of such portions of the exhibit at Frankfort as were necessary to give a good idea of the exhibit and its installation.

Under these instructions I left Chicago September 17, and traveling *via* New York, Havre and Paris, I arrived at Frankfort on the afternoon of September 28.

THE SERVICE PLANT.

Beginning at the boiler house, power and light were supplied after the following scheme: Manufacturers of boilers wishing to place their machinery in competition were charged for the space it occupied under the regular schedule rates, installed the machinery, laid the foundation, etc., at their own expense. The Exposition company furnished the fuel employed, but exhibitors maintained and operated their own machinery. The wiring used for the service of the Exposition was obtained by rental, the Exposition paying for the three months use thereof five per cent. of the selling price, the owner to reclaim it at the close of the Exposition. The boiler house being adjacent to the main machinery hall, in which were the engines and electric generators, expense for connecting was borne jointly by the boiler and engine exhibitors. Exhibitors of engines were charged for the space which their engines occupied in the main machinery hall; each exhibitor installed his engines at his own expense, and paid to the Exposition company an agreed amount for the steam necessary to operate the engines. Belting and the incidental apparatus for operating the generators from the engines were paid for by the exhibitors of dynamos, and these in their turn were charged for the space occupied by their generators and their electric apparatus, and the Exposition company derived an additional revenue by charging the dynamo exhibitors for the power from the engines which was necessary for the operation of their machinery. The Exposition company did the work of wiring necessary for the various department buildings and charged against each exhibitor in these buildings an amount necessary to cover the cost of the light furnished to each. By this system of able financiering the Exposition company, sharing only in the expense to the extent of the wiring and the fuel, obtained revenue, first, from the steam which came from the boilers, second, the power from the engines which were operated from this paid for steam, and third, for light furnished to individual exhibitors. Lamps, incandescent and arc, were furnished free of cost to the Exposition company in all the buildings and about the grounds by those exhibitors making displays of this class of apparatus.

Of course, those exhibitors operating dynamos to supply current had the privilege of lighting space in which other of their own apparatus was on exhibition. While the financial engineering incident to this part of the work reflects great credit on the management of the Exposition, a repetition of the system would hardly be possible, either in Frankfort or elsewhere. There seemed to have been a misunderstanding between exhibitors and the corporation as to the expenses incident to exhibition, until exhibitors had progressed so far in their arrangements that it became impossible for them to decline exhibiting, therefore items of expense were borne which would not be tolerated on a second occasion.

INSTALLATION OF EXHIBITS.

As has been before stated in this report, exhibits were divided into sections according to their affinity, and were placed in 10 or more buildings. The large firms making general exhibits, therefore, were compelled to prepare, install, maintain and pay space and lighting charges at several points. In two instances, at least, corporations operated and maintained 12 exhibits each, in separate buildings or out of doors remote from the other locations of exhibits of the same firms. However much they might have desired to do so, the management of the Exposition, carrying out its policy of sectionalizing exhibits according to their relationship to each other, would have found it impossible to save exhibitors the expense incident to the maintenance of these separate exhibits. Some of those in attendance upon the Exposition, and, at least, a few of the directors of the corporation, maintained the position that the existence of several exhibits of one firm at different points in the grounds or buildings, was an advantageous condition to exhibitors, because the tendency on the part of visitors would be to magnify the exhibitor's importance on account of his presence at so many points. The exhibitors, on the other hand, contended that the added expense incident to this separation of exhibits, was not justified by the impression made on the minds of visitors; and contended further that the installation and maintenance of exhibits at so many points was too expensive to allow of that amount of decoration and the preparation of those features necessary to attract visitors. At least, exhibitors were unanimous in the contention that the system was not one calculated to serve their best interests, and I would respectfully present this feature of my observation to the consideration of the management of the World's Columbian Exposition.

SCIENTIFIC.

Europeans very justly pride themselves upon their achievements in the scientific field of electricity and have been materially aided in their laborious work by government support, especially in the educational institutions. There were evidences of great progress in electrical work at Frankfort, especially in the direction of the generation and control of the electric current. Many complications in the constitution of electric generators have been discarded in exhibition machinery, new systems of transformers of the electric current from high to low potential were on exhibition, and new devices for long distance transmission of the current were, for the first time, placed in operation. I refer more particularly here to the experiments made in electric transmission of power from Lauffen, on the River Necker, to the Exposition grounds, a distance of 120 miles. In their experiments, the scientific gentlemen undertook to convey 300 horse-power of current over this distance from a turbine operating in the River Neckar over a new three-wire alternating circuit at 25,000 volts pressure. By a double system of transformers at Lauffen and at the Exposition grounds, it was intended to reduce the pressure to 110 volts at the latter place and to operate a circuit of incandescent lamps and motors from the same. The experiment was an expensive one, the cost of which was met by a subscription, and by the liberality and confidence of the two companies which undertook it, by the donation of 10,000 marks from the Emperor and by a like donation from the Exposition company. The 360 miles of m. m. copper wire were loaned gratuitously by F. A. Hesse & Company, of Hedderheim. The Algemeine Electricitäts Gesellschaft, of Berlin, and the Oerlikon Company, of Zurich, made the experiment under the direction of Prof. Michael von Dolivo-Dobrowolsky. The current was transmitted as intended and the lighting of incandescent lamps was done and to that extent the experiment was a success. Good authorities deny, however, that more than 13,000 volts of pressure were attained, and I believe the projectors will not claim to have saved for final application more than 60 per cent. of the original power, the loss being approximately 20 per cent. in the dynamos and transformers and the other 20 per cent. in transit. No really satisfactory tests of measurement were made. For all practical purposes, however, the experiments were essentially successful in that the principles set forth were demonstrated.

LIGHTING.

Lighting of art galleries by the use of arc lamps was a feature that attracted much attention, and was brought to a state of perfection not hitherto achieved. The exhibitors were S. Elster & Company, of Berlin, and their process of lighting consisted in the total shading of pictures from the rays of light by the use of yellowish-tinted ground glass laminated reflectors. Large cambric screens behind the lamps to throw the light upon the walls completed the system, which was uniquely simple and more clearly resembled the light of day than any other system which the visitors had ever seen.

Another achievement peculiar to Europeans was the exhibition of electric searchlights and reflectors, especially the immense ground glass parabolic mirrors, 80 inches in diameter, which, with an arc light requiring 10 horse-power to maintain, cast shadows at a distance of 45 miles. Still another noteworthy feature, and one in which Europeans far surpass Americans, was in the direction of stage lighting for theatres and electric ventilators for the same. Two theatres were on the Exhibition grounds, one in miniature, in which were installed two distinct systems of theatre lighting, both deserving more than passing praise. By one of these systems the lights and shades incident to each of the 24 hours of the day, with all of the beautiful tints of dawn and twilight, the noon-day sun and the midnight moon, were marvelously portrayed.

GENERAL FEATURES.

These and other features of electric progress were visible at the Frankfort Exposition, to indicate the untiring zeal, energy and intelligence with which Europeans are pursuing the star of progress, and though in the practical application of electricity this country is far in advance of Europe, this is no reflection upon the state of the science on that hemisphere, but indicates rather the generally progressive characteristics of the American people, who appreciate to the extent of their application the new things which their scientific men design for their comfort, convenience and enjoyment.

While it is, of course, impossible to go closely into detail in a report of this character, yet I would respectfully submit that during my stay in Frankfort I took occasion to make careful notes accurately in detail of installation at the Frankfort Exposition, and these I feel will be of infinite benefit in the installation of the electrical exhibit for the World's Columbian Exposition.

COLUMBIAN ELECTRICAL CONGRESS.

As a part of my work in Europe, under instructions from the chief of the department of electricity, I visited several of the scientists of England and the Continent in behalf of an international electrical congress, for the success of which the chief of the department of electricity has been working since his appointment, and I am prepared to state that the success of the congress is assured; providing, of course, it is prepared and carried out in a manner satisfactory to the scientific men who will create its dignity and make its chief value. Among those whom I conferred with regarding this congress were: Prof. Galileo Ferraris, of Italy, Professor Siemens, of Berlin, Prof. W. E. Ayrton, of City Guilds College, London, W. H. Preece, Esq., F. R. S., electrician in chief telegraph department of the British government, M. Hospitalier, of Paris, and M. Abdank-Abokanowitz, of Paris.

The consensus of opinion expressed by these distinguished men and others of eminence, I may be excused for setting forth, in the abstract, as follows:

Hitherto, electrical congresses have not been successes, and essentially for the reason that the methods of their organization were not calculated to give them that dignity necessary to the accomplishment of effective work. In electricity there are practically no international electrical units such as are present in other sciences, and standards of measurement are not of that arbitrary character which would have grown out of official, authorized action in their establishment.

In arranging for such a congress as these men deem it necessary to have, they think the United States government ought to father the invitations and that it ought to be held under government auspices; that invitations ought to be issued to individual scientific men of the world by the United States government, through the governments to which the individuals belong. This course of action, the gentlemen say, will insure an official character to the proceedings of the scientific congress, and will virtually pledge the various governments to a recognition and adoption of the standards created. If such a congress is to be held at all, it can only be a success along these lines, for past experience has determined the men without whose aid such an affair would fall flat to decline participation in any congress which has for its end less than the work outlined above—to the conclusion that the World's Columbian Exposition shall mark a distinct epoch—and the greatest one in the history of electricity. Further than this, it is admitted that while Americans have done at least their part for humanity in the science, there are no recognized units credited to Americans, and there is not a single mark made by an American in the nomenclature of the science. It is intended to alter this in case such a congress shall be held.

To carry out such a work as these scientific people picture to themselves, they would have established a purely scientific committee, embodying a member from each of the important governments, at least those which have contributed materially to the progress of electrical science, the duty of which committee should be to prepare a programme, including a settlement of the issues to be discussed and the individuals to take part in this discussion, to attend the preparation of scientific work, etc.; in fact, to prepare for the congress in all directions appertaining to science. Another working committee should also be appointed for the preparations other than scientific, to include gentlemen interested in the commercial success of electricity, and this committee could also convene, if it were deemed advisable, a congress of electrical engineers, which would indulge in discussions of commercial value of the appliances of electricity.

One other point was made by European scientists, namely, that such a scientific congress should be convened in August or September, as those months constituted the vacation of European professors, and nearly all the desirable electrical scientists of Europe are teachers in the educational institutions. They would probably not be able to attend during any other season.

In conclusion, I beg leave to report that Europeans fully appreciate the magnitude and completeness contemplated for the World's Columbian Exposition, and that they have arrived at that point in their enthusiasm where their chief topic of discussion in connection with it is that of the sufficiency of the means of trans-Atlantic transportation for passengers and freight.

All of which is respectfully submitted,

J. ALLAN HORNSBY,
Secretary Department of Electricity.

KINDRED INTERESTS

The "C. & C." Electric Motor Company, New York, are sending out their valuable and handsome pamphlet on "The Transmission of Electric Power."

The Heisler Electric Light Company, of Philadelphia, is sending out a handsome catalogue explaining in detail and with illustrations the merits of the Heisler system of long distance series incandescent lighting.

The International Okonite Company, New York, has issued a new price-list of their well known wires, cables and tapes. The catalogue is tasteful in appearance and conveniently arranged for easy reference.

The Union Electric Manufacturing Company, of Bridgeport, Conn., the well known lamp socket manufacturers, are sending their friends a very neat and convenient blotter. A handsome cut of their lamp socket adorns the back of the blotter.

The Wood water tube boiler, manufactured by the Schuyler Foundry and Machine Works, Conshohocken, Pa., has been prominently brought to public attention of late. Its efficiency, especially in electric plants, has made for this boiler many friends in electrical circles. Mr. Wood, the patentee, has many flattering testimonials relative to the effectiveness of his boiler, and we gladly publish the following as an illustration:

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The Crocker-Wheeler Electric Motor Company, New York city, have just issued a revised and extended catalogue. It is an interesting pamphlet of over 50 pages. To those seeking information regarding the electric motor and its numerous applications, the Crocker-Wheeler catalogue must prove of great value. The text, which is profusely illustrated, discusses at length the construction of the Crocker-Wheeler motors and their special features, with convenient and valuable table of dimensions, etc. There are also directions a-plenty for setting up, connecting and running these popular motors. An interesting chapter on "Windings" engages the attention, also a table of sizes and types of motor manufactured for constant potential circuits. The fireproof starting, regulating and reversing boxes made by the Crocker-Wheeler Motor Company are described, and considerable space is given to their small motors, $\frac{1}{6}$, $\frac{1}{3}$ and $\frac{1}{12}$ horse-power, together with their application to electric fans, electric pumps, etc. The arc circuit or constant current motors, Crocker-Wheeler type, are fully described and illustrated.

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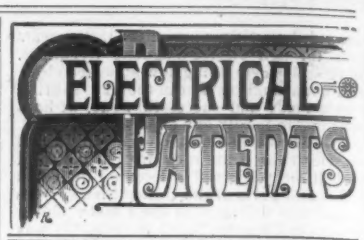

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON OCTOBER 27, 1891.

461,868 Electric connection; James H. Fleming, Newark, N. J.
461,887 Multipole system for telephone exchanges; William E. McKivitt, St. Paul, Minn., assignor to the Western Electric Co., Chicago, Ill.
461,898 Incandescent electric lamp socket; Cecil P. Poole, Lynchburg, Va.
461,965 Galvanic battery; Calvin N. Souther, Chicago, Ill.
461,969 Electric railway; William B. Vansize, Plainfield, N. J.
461,979 Dynamo-electric machine or motor; Max Mayer, New York, N. Y., assignor to the Zucker & Levett Chemical Co., same place.
461,991 Lightning arrester; Edward W. Van Brunt and William M. Raynor, Scranton, Pa.
462,014 Electric railway; George W. McNear, Oakland, Cal.
462,020 Automatic regulator for dynamo-electric machines; William L. Silvey, Lima, O.
462,022 Electric railway switch; Hollon C. Spaulding, Boston, Mass.
462,033 Circuit controller; William B. Cleveland, Cleveland, O.
462,053 Rheostat for electric lamps; Thomas A. Lacey, St. Paul, Minn.
462,153 Underground system for electric railways; Samuel D. Nesmith, Cleveland, O.
462,177 Electric railway; Charles W. Thomas, New York, N. Y., assignor of part to Phillip Van Volkenburgh, same place, and John H. Pendleton, Brooklyn, N. Y.
462,207 Method of welding or working metals electrically; Charles L. Coffin, Detroit, Mich.
462,219 Electric railway trolley; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co. of Connecticut.

ISSUED NOVEMBER 3.

462,231 Electric railway; Edward M. Bentley, New York, N. Y.
462,237 Electric lighting system; Joseph I. Conklin, Brooklyn, N. Y.
462,261 Automatic electric welding machine; Hermann Lemp and Carl G. Anderson, Lynn, Mass.; said Lemp assignor to the Thomson Electric Welding Co. of Maine.
462,311 System of electric lighting; Frank M. Garland, New Haven, Conn., assignor of two-thirds to Nicholas W. Hubinger and Joseph E. Hubinger, both of same place.
462,315 Electric wire support bracket; Osborn B. Hall, Malden, Mass.
462,321 462,322 Electro-magnetic separator; Richard R. Moffatt, New York, and Sylvester Chichester, Brooklyn, N. Y.
462,338 462,339 Incandescent lamp; Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.
462,345 Electric signaling system; Frank B. Wood, New York, N. Y., assignor to the Brewer & Smith Visual Signal Co., New Haven, Conn.
462,348 Gearing for electro-magnetic motors; Chas. E. Chinnock, Brooklyn, N. Y.
462,353 Electric switch; Maurice Hooper, West Chester, Pa.
462,359 Clamp for trolley wires; Charles A. Lieb, New York, N. Y.
462,369 Controlling device for electric motors. 462,466 Commutator brush; Francis O. Blackwell, New York, N. Y., assignor to the Thomson-Houston Electric Co. of Connecticut.
462,381 Electric alarm bell; Charles A. Hale, Cleveland, O., assignor to the Time Electric Co., same place.
462,403 Electric gate; Harleigh Gillette, Highland Park, Ill.
462,407 Electric switch; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co. of Connecticut.
462,418 Method of and apparatus for electrical conversion and distribution; Nikola Tesla, New York, N. Y.
462,444 Electric lighting apparatus; Harrison B. Meech, Chicago, Ill.
462,449 Secondary battery; John H. Palmer, Boston, Mass.
462,452 Electric fuse cut-out; Edwin W. Rice, Jr., Lynn, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.
462,463 Switch and cut-out device; Henry P. Ball, Brooklyn, assignor to the Edison General Electric Co., New York, N. Y.
462,477 Covering for the bulbs or globes of electric or other lamps; Alexander Duval and Henri Nelson, Paris, France.
462,489 Conductor for three-wire systems; Edward H. Johnson, New York, N. Y.
462,504 Electric current meter; Johan W. Th. Olan, New York, N. Y., assignor of one-half to Edward H. Johnson, same place.
462,513 Automatic signal apparatus; Joseph B. Stewart, Haverstraw, assignor of one-half to Wm. G. Wattson, Tappan, N. Y.
462,527 Electric elevator; Harry H. Blades and William J. McKee, Detroit, Mich.
462,532 Electric cooking stove; John V. Capek, New York, N. Y.
462,540 Incandescent electric lamp; Thomas A. Edison, Llewellyn Park, N. J.
462,564 Cross-tree for suspended electric wires; Jacob Levy, Shreveport, La.
462,571 Electric lamp cover and switch; Emil T. Mueller, La Crosse, Wis.
462,574 Key socket for double filament incandescent lamps; William J. McCutcheon, Jr., Pittsburgh, Pa.
462,578 Trolley for electric cars; Robert D. Nuttall, Allegheny, Pa.
462,595 Electric railway; James B. Sheldon and Daniel J. Murnane, St. Louis, Mo., assignors to the Underground Electric Traction Co., of Missouri.
462,599 Electric hair brush; Alexander Stanton, Lynn, Mass.
462,624 Electric arc lamp; Thomas Conroy, Kansas City, Mo., assignor of two-thirds to Albert W. Dold and Lewis P. Fuhrman, same place.
462,660 462,661 Electric arc lamp; Fred. H. Carpenter, Boston, Mass., assignor to the Russell Electric Co., same place.
462,662 Carbon holder for electric arc lamps. 462,663 Pencil carbon holder for electric lamps; Henry E. Chapman, Melrose Highlands, assignor to the Russell Electric Co., Boston, Mass.

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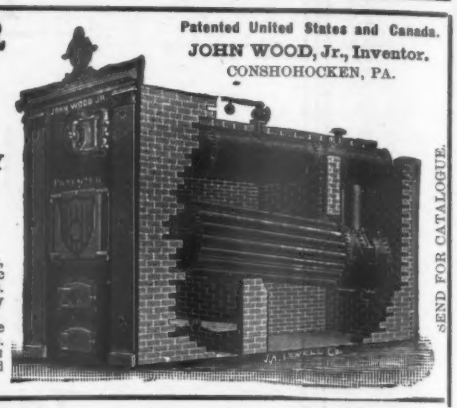

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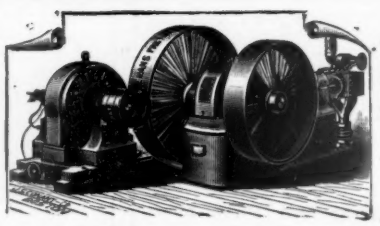

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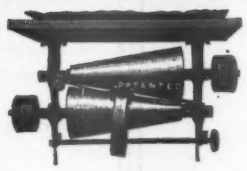

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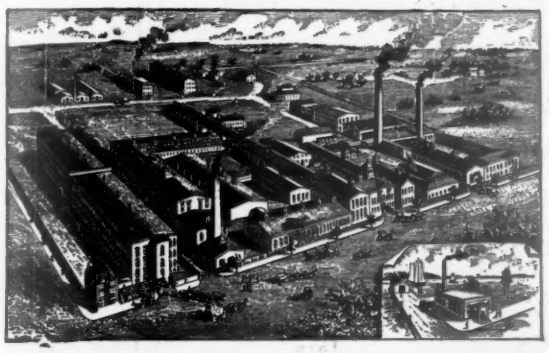

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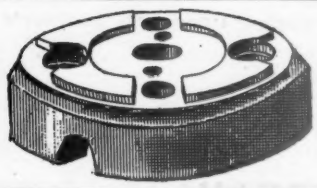

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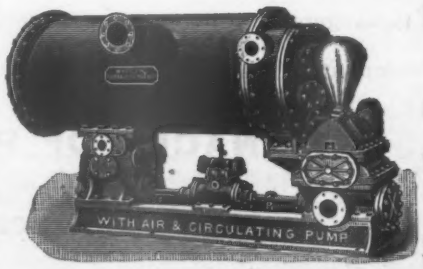

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